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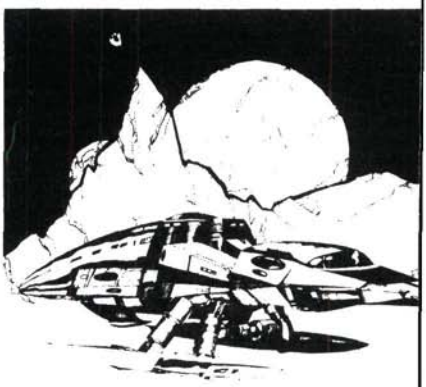

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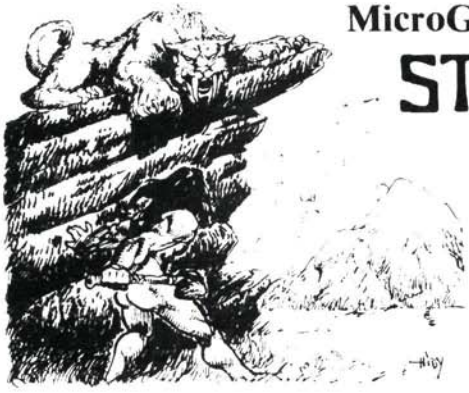

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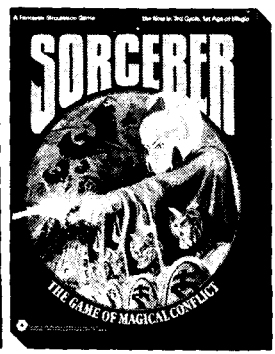

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Editorial Assistant
HERBERT S. STOLTZ
Art Director
GERALDINE PRASIOTIS
Advertising Production Manager

Next Issue on Sale
March 6, 1979
$10.00 per year in the U.S.A.
$1.25 per copy

Cover by John Sanchez

Vol. XCVIX No. 4
APRIL 1979

SCIENCE FICTION
analog®
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Second class postage paid at New York, N.Y. and at additional mailing offices. Publication No. 0161-2328. Published monthly by Conde Nast Publications Inc. Subscription rates $25.00 for three years. In Canada and Mexico, $12.00 for one year, $22.00 for two years, $31.00 for three years. Elsewhere, $13.00 per year, payable in advance. Single copies in U.S., possessions, and Canada, $1.25. For subscriptions, address changes and adjustments, write to Analog Science Fiction/Science Fact, Box 5205, Boulder, Colorado 80323. Eight weeks are required for change of address. Please give both new and old address as printed on the last label. Postmaster: Send form 3579 to Analog, Box 5205, Boulder, Colorado 80323. First copy of new subscription will be mailed within eight weeks after receipt of order. The editorial contents have not been published before, are protected by copyright and cannot be reprinted without the publisher's permission. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. We cannot accept responsibility for unsolicited manuscripts or art work. Any material submitted must include return postage.

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POSTMASTER: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, BOX 5205, BOULDER, COLORADO 80323.

ISSN 0161-2328

offices: Conde Nast Building, 350 Madison Avenue, New York, New York 10017

Subscriptions:
Analog
Science Fiction/Science Fact,
Box 5205,
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LIBERAL EDUCATION

Before coming to Analog as editor, I spent several years teaching at a small liberal arts college—a term which, I am told, means this institution was dedicated to liberal education. I always thought that sounded like a wonderful idea, but I'm not sure I always agreed with all my colleagues on exactly what it meant and what we were after.

Even dictionaries tend to be a bit vague. *Webster's New International (Second Edition)* defines liberal education as "Education primarily for culture and by means of the liberal arts." The "liberal arts," it says (in a rather long paragraph) in modern times include "the languages, sciences, philosophy, history, etc."; "culture" it defines in a variety of rather nebulous and overlapping ways. The first few pages of my college's catalog tell us that, "A liberal education enables each individual to understand the broad societal context in which he or she operates, and to function effectively within that society to make judgments, think independently, analyze logically, respond to the fine arts and to develop a spiritual relationship with God." And, a little later, "The college believes that the liberally educated person is best prepared to creatively confront the challenges offered in a world undergoing change at a pace unknown to prior generations. . . . Because of its commitment to the liberal arts, the college's aim and purpose as outlined in its charter is the culture of the whole person."

(Necessary digression: In these

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quotes, I have substituted "The college" for the name of this particular college, because the name of the particular college is unimportant. I am talking here about general trends and attitudes, subjectively observed, which can be found on any campus; they are neither peculiar to, nor uniformly characteristic of, this one. I want to make it very clear at the outset that if any of my remarks appear critical, they are not aimed at any particular institution or individual—and that my own feelings for my particular college were and are, on the whole, very favorable.)

Perhaps the best statement I found of what my college's faculty seemed to agree they were after is the one in the *Funk and Wagnalls New Practical Standard Dictionary*, which gives as one meaning of *liberal*: "Appropriate or fitting for a broad and enlightened mind; as, a *liberal* education; *liberal* arts."

Hear, hear!

Who could argue with that? But now listen to a few things I saw in practice.

Richard P. Feynman (who has since won a Nobel Prize for his work with quantum electrodynamics) once gave a remarkable series of seven lectures at Cornell University on "The Character of Physical Law." These were remarkable in being so nontechnically presented and yet so profound that either a complete layman or a practicing physicist could find important insights in them—and they are readily available, because the entire series was filmed and published. I once showed the entire group as a weekly series, at an hour with minimal schedule conflicts and with ample campus-wide publicity stressing the unusual nature and accessibility of these films. One member of the nonscience faculty came to watch them.

One.

Fairly early in my college teaching career, the faculty undertook a rather massive curriculum reform, which involved many hours of heated debate over what should be required in the new curriculum. Much of the debate was sharply reminiscent of C. P. Snow's *Two Cultures*. There were individual exceptions, of course, but a pronounced general trend had faculty in the natural sciences struggling to see that all students had some exposure to natural science, while representatives of other fields fought to keep that requirement as small as possible. Some wanted to eliminate it entirely. (The figure finally adopted was roughly a quarter of the "core" course requirement, or less than ten percent of a student's total coursework.)

A few years later, a computer science program was introduced as an optional second major—that is, a student could not major only in computer science, but he (or she) could earn a major in that field if he also earned one in some other field. Even this option was bitterly opposed in some quarters—and some of the opposition arguments seemed to focus on the fact that such a program would be very

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directly *useful* on the job market, and direct usefulness (I gathered) was somehow not consistent with the liberal arts orientation. (I should mention in passing that later, when the enrollment crunch afflicting private colleges all over the country finally caught up with this one, it did a good deal of expansion into other directly useful programs.)

The significance of all this? The pattern that emerges quite clearly to my eyes is that many nonscientists accept science, mathematics, and technology only grudgingly as parts of a liberal education—and some do not accept them at all. But how can anyone seriously claim to be liberally educated when he (or she) has studied nothing but the peculiarities of one species of animal?

And please note: if you eliminate the natural sciences and math, that's about all that's left. The social sciences, humanities, and arts . . . of one species of animal. A very important species, to be sure (from our perhaps somewhat biased point of view), but surely not all there is to the universe. Or even (William Faulkner notwithstanding) all that's worth thinking or writing about.

Is ten percent of his attention too much for a student to give the rest of the universe?

At this point somebody usually pounces on me as a "typical scientist who doesn't appreciate the humanities." Sorry; not guilty. I do not by any means deny the value of the humanities and social sciences—as *parts* of a liberal education. I do deny—emphatically—that they can in any way be considered a *complete* liberal education. Take another look at that second quote from my college catalog, about preparing to meet the challenges of a fast-changing world. How can you do that if you know nothing about the factors producing those changes, many of which are directly scientific or technological?

And that applies to *solutions*, if they are to be found, as well as to problems—which will always be found whether you look for them or not.

It seems quite odd that so many people, including scholars, go on venturing into that unfolding future with little or no knowledge of the principles which are shaping the changes and may provide the needed adaptations. Some apologize for their lack of scientific knowledge but make no attempt to correct it. A few I've met actually seem somehow *proud* of their ignorance. These are extreme cases, of course, and there are conspicuous exceptions—scientifically untrained people who do try to fill in some of the gaps. A historian once sat in on my astronomy course, and that English professor did come to the Feynman films. But in the larger scheme of things, the fact that he came seems somehow less significant than the fact that he was the *only* one who did.

By contrast, the science faculty was usually well represented at plays, concerts, ballets, or political lectures on campus. A popular stereotype depicts

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scientists and engineers as narrowly specialized, knowing or caring about little outside their professional pigeonholes, but the ones I know include many with very wide-ranging interests. Most attend such functions at least occasionally as spectators, and a good many are active participants. I personally have deep and active roots in music, literature, languages, and photography, and I do not feel out of my element at an art museum or an anthropology lecture. Nor do I feel particularly unusual in this regard. I've played in at least one part-time symphony orchestra in which a majority of the wind players were academic or industrial chemists, physicists, or electrical engineers. I certainly wouldn't claim that all scientists or engineers are proficient or even knowledgeable in the arts. But I know far more of them who are than the other way around: I know distressingly few humanists who are also amateur scientists. (Yes, I do know a few.) It seems to me that the actual incidence of really broad interest and education, whether acquired in school or elsewhere, is highest among those most often accused of "narrowness."

There was another mild curiosity that I noticed during the curriculum debates and again when falling enrollments led to talk of retrenchment. Language departments with waning populations tended to vocally justify their continued existence—and push for language requirements—by a variety of arguments. My favorite was the claim that the study of foreign languages expands people's mental horizons by exposing them to alternative thought patterns and different cultures. Now, before my friends in the languages think I've turned on them, let me emphasize that I am very much in favor of language study—I've studied many more than I had to myself, and I'd much rather see language departments added than dropped—and I consider this particular argument an especially strong one in favor of language study. But if this mental expansion is a good reason to study Spanish or German, how much stronger a case does it make for studying non-Indo-European languages? Some of the ways of thinking found in relatively distant Indo-European languages can look pretty novel to someone encountering them for the first time—the "aspects" in Slavic languages, for example. But study something with *really* different ways of organizing thoughts—say, Swahili or Chinese or Eskimo—and then, by comparison, Spanish and German and Russian will look like little more than dialects of a single basic tongue.

And while it's true that reading a foreign literature in its original form provides a mind-stretching insight into a different culture, surely more mind-stretching is required for an urban American to get inside an Amerindian, Oriental, or Australian aboriginal culture than to do the same with the German or French.

For similar reasons, I would think that if an institution is to require its students to study certain "social sci-

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ences," cultural anthropology should be high on the list.

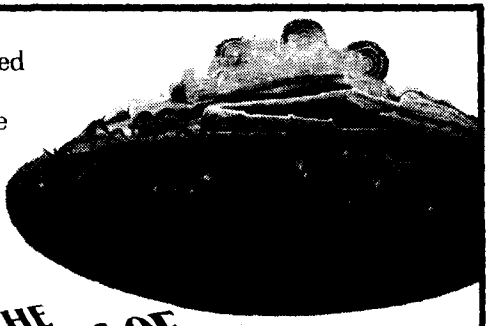
It seems I'm in wholehearted agreement with the basic idea of liberal education. But I'm often skeptical about how educators apply their own words when it comes down to the nitty-gritty of deciding what should actually be included. I want to see *real* breadth: nontrivial amounts of *both* sciences and humanities; cultures and ways of thinking as foreign as possible to our own, as well as those containing our own immediate roots; highly practical skills, from basic survival to computer-programming and cello-playing, as well as abstract knowledge. . . .

But why should I try to list them all? I'd never finish—just as a real education never finishes. Besides, Lazarus Long, in Robert Heinlein's *Time Enough for Love*, has already said so well what I'm trying to say: "A human being should be able to change a diaper, plan an invasion, butcher a hog, conn a ship, design a building, write a sonnet, balance accounts, build a wall, set a bone, comfort the dying, take orders, give orders, cooperate, act alone, solve equations, analyze a new problem, pitch manure, program a computer, cook a tasty meal, fight efficiently, die gallantly. Specialization is for insects."

His list isn't exhaustive, either—and few people could meet even all these criteria. But as an ideal to strive for. . . .

It's as good a definition of truly liberal education as *I've* ever seen. ■

Though their lives are separated by two thousand years, two obsessed men reach out for the same dream—to touch the stars. Each comes within sight of his ambition—and finally pays for his triumph. From the author of *2001*, *Childhood's End*, and *Rendezvous with Rama*.



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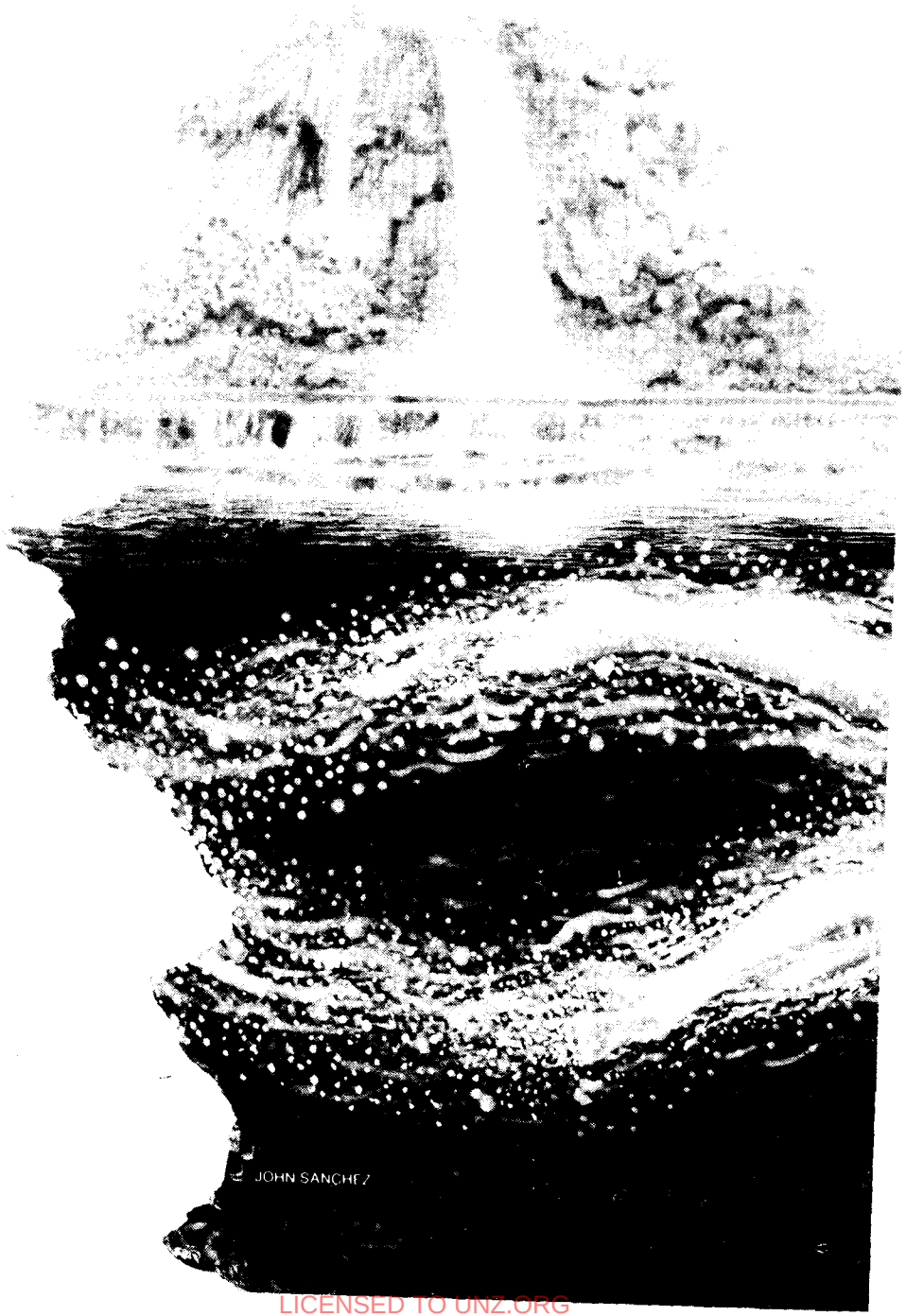

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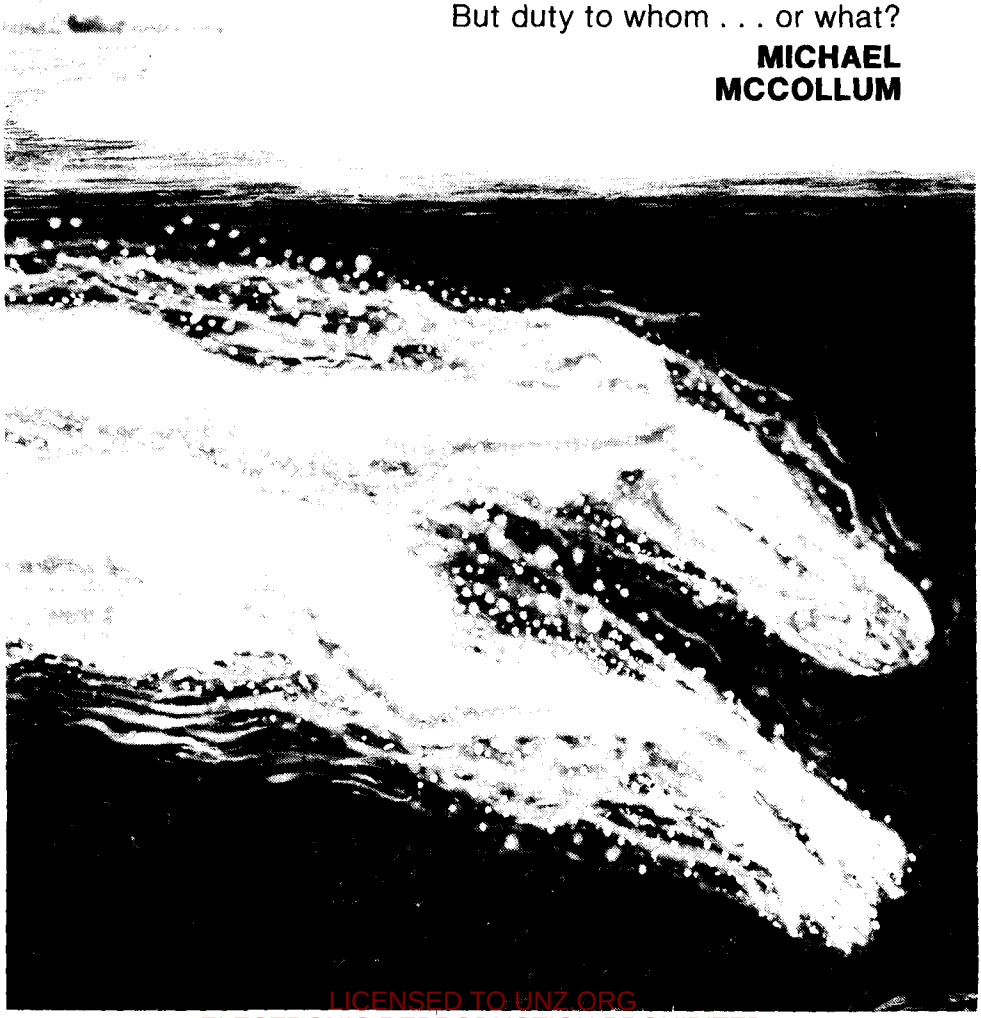
DUTY, HONOR, PLANET

Duty: a subtle and important concept.
But duty to whom . . . or what?

MICHAEL MCCOLLUM



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Jan Pieter Heugens had been a hod carrier, a sailor, a revolutionary, and a hard working diplomat in his time. As he stood before his spacious office window and watched the rain sluice down on New York from leaden skies, he reviewed his checkered career with a mood that matched the gloom of the weather. In the last dozen years he had seen famines, and floods, and revolutions aplenty—all of which the UN had somehow weathered under his stewardship as Secretary-General. As he watched the rivulets of water cascading down the glass wall in front of him, he wondered if either he or the UN would last long enough for his term of office to reach a dozen and one years.

The oaken door behind him opened and his secretary ushered a ragged figure inside. Heugens took a deep breath and turned to face the man he was careful to think of only by his code name, "Bernard."

Bernard peeled off a threadbare raincoat and tossed it over the back of one of the leather chairs in front of the Secretary-General's desk.

"Did you have a good flight down?"

"Average good for a re-entry, Mr. Secretary-General. A little bumpy on final approach to the Cape," Bernard said, seating himself in the other chair. "I see by the *Times* that the Security Council has scheduled a vote for next Wednesday."

"Don't believe everything you read in the papers. Torres isn't about to let it come to a vote. The Motion to Censure is dead. It just hasn't laid down yet."

"Then we go as planned?"

"We go as planned. Have you found your man?"

Bernard nodded. "Yes. Of course, a thousand things *could* go wrong."

"Such as?"

"Our intelligence could be faulty. Maybe Torres is on to our scheme and feeding us what he wants us to hear."

"In that event, Bernard, we'd better prepare for the firing squad."

"What about Warren? Can we trust him?"

"He *is* the President of the United States. If not him, who?"

Bernard's response was a rude noise.

"When can you get the ball rolling?" the S-G asked, tamping tobacco into his pipe. His doctor wouldn't let him light it, but the act of holding it clenched between his teeth relaxed him.

"Forty-eight hours."

"Then we start operations two days from now. You may put our plan into action."

"Order acknowledged, Mr. Secretary-General."

Heugens sighed. Now that the decision had finally been made, the burden on his shoulders felt lighter than it had in days.

"How about a glass of sherry before heading back?" he asked his visitor.

"A whiskey'd go down better."

"Then a whiskey it is!"

The Earth was a blue-white jewel

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poised against the jet black canvas of open space. Occasionally a patch of brown, or green, or grey would poke through the all encompassing white bands of clouds that girded the globe and obscured the familiar outlines of the seas and continents.

Friedrich Stassel gazed absently at the viewscreen at one end of the mess hall and noted the trailing terminator was near the western salient of Africa. He hurriedly gulped down the last of his tea. Two quick bites finished off the last of his toast and peach marmalade. It was late and he was due on duty in a few minutes.

Unnoticed by Stassel, Major N'Gomo, the Station Executive Officer, stepped through the mess hall hatch and surveyed the crowded room with sharp eyes. He spotted the young German and moved quickly through the clutter of tables and subdued conversation to stand beside him. Stassel looked up to see a set of flashing white teeth set in a face of darkest ebon.

"The Commandant would like to see you, Fred," the Ghanian said.

"Yes sir," Stassel replied. He looked quizzically at N'Gomo, but the Exec's face was an aloof mask as always. No one could ever tell what went on behind those yellow tinged eyes. Stassel gathered up his tray, standing slowly to keep the cup and silverware in place in the one-third gravity of the space station, and headed for the main hatch. As he passed the disposal chute he stuffed the utensils into its gaping maw with a clatter of steel on steel.

The Commandant's office was ninety degrees spinward around the Station's rim from the officer's mess. Stassel quick stepped his way around the rising curve of the Alpha Deck corridor, hurrying as fast as the in-station traffic laws would allow. He chewed his lower lip and wondered about the summons as he walked, mentally reviewing all of his activities for the last week. Had he committed an offense serious enough to warrant being called on the carpet by the Commandant himself? Offhand, he couldn't think of anything.

Of course, just because you didn't know about it was no sure indication of a clear conscience as far as General Heinemann, the Commandant, was concerned. More than one officer had walked jauntily into Heinemann's office, only to emerge a whipped man. Rumor was that the Commandant could see through steel bulkheads up to a centimeter thick. Stassel had no reason to doubt it.

Outside the Commandant's office, Stassel stopped to check his uniform in the mirror provided for just that purpose. A blond young man with Heidelberg dueling scars around his scalp, a serious face, and soft blue eyes that ill befitted a soldier peered out of the mirror at him. The picture was completed by an asymmetric nose—the result of ejecting from a burning plane at too high a speed in pilot training—and a spotless black and silver uniform. He carefully brushed a couple of imagined wrinkles from his tunic and rubbed mirror-polished

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boots on pants legs for insurance.

Then he took a deep breath and knocked on the Commandant's door. A few seconds later he heard a muffled order to enter. Stassel marched to the front of the Commandant's desk, snapped to attention, and saluted. Heinemann was making notes on a yellow note pad and continued writing as Stassel held the salute.

After a few moments he put down the pen and looked up his steel grey eyes more tired than Stassel could remember having seen them before. The Commandant returned the salute and leaned back in his chair.

"Have a seat, Friedrich. Smoke if you like."

Stassel was momentarily startled by General Heinemann's use of his first name. He hadn't known that the Commandant knew it. He hesitantly took one of the grey UN issue chairs in front of the desk, politely declining a cigar from the Commandant's humidor.

"How is your dear mother? It's been almost five years since I've seen her," Heinemann said, puffing a stogie alight and blowing a blue cloud of smoke toward the ventilator shaft. "I'm afraid I have been derelict in not visiting since your father left the service."

"Mutter is fine, Herr General."

"I served under your father inboard *Graf von Bismarck*. Did you know that? I was his Executive Officer and his friend."

"My father used to talk a great deal about his days in space aboard *Bismarck*, Herr General. He spoke of you often, and only with highest regard."

"I was sorry to hear of his death last year, Friedrich. An accident on the *autobahn* is a tragic end for a spaceman, no?"

"Yes sir. Most tragic."

"He was a good German, your father. In your great-grandfather's time, that was a term of derision, Friedrich. Did you know that? It has been men like Hans Erich Stassel who put some respect back into the word *Deutschlander*. Why as late as fifteen years ago, a Luftwaffe officer could never have worn black and silver. To do so would have been to invite comparison with Hitler and his maniac Schutzstaffeln, the dread SS. Do you understand what a handicap we have had to overcome, Friedrich? It was no easy thing to re-earn the respect of civilized folk after having lost it so thoroughly."

"Yes sir." Stassel wondered what the Commandant was getting at. The old martinet didn't usually give himself over to reminiscing. It was a bad sign.

The Commandant cleared his throat, and snubbed out the burning cigar, attacking it as if it were an enemy. "I have orders, Hauptmann Stassel. You will report to the shuttle docking portal immediately after your meeting with the Briefing Officer. There you will take the in-orbit shuttle to Peace Control Satellite Alpha-Nine for duty until relieved. Your personal gear is already aboard. So get going. *Raus!*"

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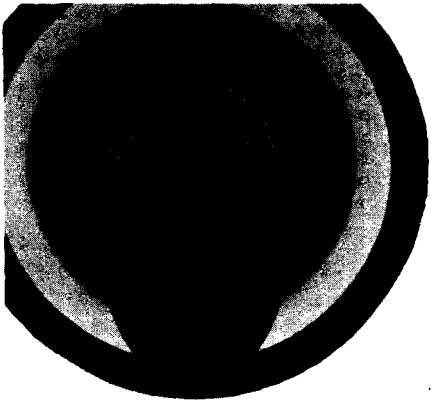

ANTARES
BY JOHN CLARK

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"Alpha-Nine, Herr General? Robertson has Alpha-Nine on the duty roster next shift."

"Robertson is in the brig with Garcia. They got into a disagreement in the lounge last watch and will be cooling off for the next ten days or so."

"Robertson and Garcia? I can't believe it. What started it?"

"What else?" the Commandant asked, staring idly at the blue and white UN flag that decorated one side of his office. His voice was weary with too much strain and work.

Stassel didn't have to ask what he meant. Robertson was an American and Garcia a Mexican. Their fight had started over the border crisis, of course. They were too good friends to let anything other than women or politics come between them.

"It's getting bad, isn't it?" he asked.

Heinemann sighed. "Worse than you might think, Hauptmann. Even the ranks of the Peace Enforcers aren't immune to these internecine squabbles that have broken out all over the face of the Earth. If it isn't the North Americans against the South, then it's the Australians versus Indonesia, or Japan against China and West Russia. I tell you the whole world is going to Satan in a hand trolley." Heinemann glanced at the chronometer on the bulkhead behind Stassel. "The time is getting short, Hauptmann. You still need to be briefed."

"Yes sir."

"Before you go, Friedrich. Do you know why I am picking you for this assignment instead of the backup astronaut?"

"No sir."

"Because, like your father you *are* a good German. And the world needs more of us. We know how to follow orders without question. Few other people do. It is a much maligned trait, Friedrich. The Yankees and French are always making snide comments about blind Prussian obedience to orders. Don't let them faze you. In the current situation, blind obedience to orders is the only thing which is going to save us. I need men in orbit who can keep their heads and do their duty. Can you?"

"I think so, sir."

"So do I, Friedrich. You are your father's son. Now you had better see the Briefing Officer in Compartment One-Twelve. You are minus minutes for that shuttle launch. They'll hold it if you're late, but they won't like it."

"Thank you, Herr General."

Wing Commander Livingston was on detached service from the RAF. His powder blue uniform looked out of place next to Stassel's silver and black. Stassel sat in an aluminum chair and took notes as Livingston reeled off figures in his clipped, Oxford accent.

". . . Your area of responsibility will include longitudes 100-West to 120-West, Hauptmann. Your satellite will be in an alternating synchronous orbit with Beta-Nine, of course, and you will have prime responsibility in the northern hemisphere during even-

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watch periods and southern hemisphere during the odd. Luckily, south of the equator there is only empty ocean between 100 and 120-West, so you'll be able to get some rest.

"You are hereby directed to pay especially close attention to the situation around the US—Mexican border . . ." Livingston looked up, the podium light casting shadows on his face. ". . . Watch your ass on that one, Fred. It's a tinderbox. The Mexicans are bound to try a raid between now and the Security Council vote on Friday."

"I thought the vote would be Wednesday," Stassel said.

"Wouldn't bet on it if I were you, chap. Besides, I've got Friday afternoon in the pool. So I can hope."

"How do you think the Council will vote, Livingston?"

"I'd say they will turn the resolution down flat. There are too many people who don't like the Yanks for it to pass. They enjoy the sight of the Mex-dwarf tweaking the giant's nose, and they'll vote against it just to keep the pot boiling. But to make sure, you can bet the politicians in Mexico City will try to score another coup to intimidate the rest of the Council into voting their way. God knows it's easy enough to do."

"And if the Mexicans keep it up?"

"Then it'll come to war quick enough. With Warren in the White House, it's practically preordained. He barely scraped by last election with strong Ecocrat support. The Mex's are punching the Ecocrat's right where it hurts. Warren is going to have to take action quickly or else lose his base of power. And if it comes to war, you know what that will mean."

Stassel nodded.

It had started as an argument over import quotas on Mexican sugar beets. In the bad old days nothing would have come of it. The Mexicans would have complained to Washington, only to be ignored. A storm of injured Latin pride would have boiled up in Mexico, but they would have been powerless to act.

But the bad old days were long gone. Two things had occurred to permanently change the balance of power in the world, and not necessarily for the best as far as the current situation was concerned.

The first was the rise of the powerful Ecocrat lobby. Growing out of the environmental movement of the late twentieth century, they were a power in every democracy in the world. In the US particularly, they represented a large, powerful, and vocal voting bloc dedicated to the proposition that all things ecological were sacred. They were one issue voters, ready to kick politicians out of office *en masse* for the slightest ideological impurity.

The second development was the formation of the UN Peace Enforcers following the twenty day scare of the Misfire War. The Peace Enforcers were a multinational force with a single mission: To stop any aggressor who struck against any UN member state. Their unofficial motto was,

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"You start the war and we'll finish it!"

In theory, any act of aggression by one nation against another would be met instantly by the orbital lasers and Peace Enforcer fusion rockets. But in practice there was a threshold level of violence, a tripwire effect, below which the cumbersome Security Council machinery would fail to respond.

These two facts were the natural precursors to the current crisis on the North American continent.

Lone Mexican Air Force planes—officially piloted by bandits and renegade officers—had struck north at a series of unusual targets designed to put intense pressure on the administration in Washington in the sugar beet dispute. Instead of hitting cities or centers of military and industrial power with the nuclear weapons Mexico was rumored to have, the planes struck against targets that the powerful Ecocrat lobby considered to be irreplaceable national treasures.

Carlsbad—where a single smart bomb had penetrated the visitor center and elevator shaft to explode in the cavern below, causing massive destruction. And more importantly, sealing the caverns for a hundred years due to radioactive contamination by the Cobalt 60 powder that had cladded the high-explosive bomb.

Lake Mead—where a specially developed film of evil smelling resin lay on the surface of the lake, killing fish by the millions, leaving their rotting bodies to wash ashore and provide graphic pictures for the television cameras.

The Tonto National Forest—thirty percent destroyed in a fire storm started by Mexican incendiery bombs.

Such limited violence was primarily psychological in its impact and well below the tripwire level that would galvanize the Security Council to action. Instead of concrete action to stop the raids, the Council had indulged in bombast and recriminations. Complicating the matter were a number of small nations who supported Mexico for reasons of their own. Supported her to the point where they refused to believe the irrefutable evidence provided by Peace Control Satellite cameras. When a Resolution of Censure was finally introduced, the small nation delegates had fallen to bickering over the placement of commas.

And there the crisis stood, stalemated and explosive. But should the situation develop into a shooting war—in other words, should the Americans attack—Stassel had no doubt of the UN response.

The Peace Enforcers would be ordered in on the side of the 'innocents' being invaded. Weapons of mass destruction laboriously stockpiled in orbit would be ordered used. Every attacking missile and aircraft would be lasered out of the sky. Every ship would be destroyed at sea. And if simple surgical destruction didn't work—and against the Americans there was every reason to think it would not—then the less selective

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weapons would be released. Fusion warheads which had slept in the bellies of Peace Enforcer ships for twenty years would be unleashed against the "aggressors."

To do otherwise would split the UN into a dozen squabbling factions. The majority had always held that no provocation could be great enough to go to war.

Except in this case, the 'aggressors' would be in the right and every man and woman aboard the space stations and satellites knew it. Worse, the Americans were not the minor league imperialists the P.E.s had been formed to stop. They had ground based lasers of their own. The Peace Control Satellites were few in number and in fixed orbits. No one knew who would eventually win the fight, but one thing was certain. When the smoke cleared, the UN Peace Enforcers would be in no condition to continue their mission and war would have been unleashed once more upon the world.

"Maybe the Council will approve the Resolution of Censure," Stassel said, as the Briefing Officer struck a match and lit a cigarette.

"Care to back your opinion with cash?" the Englishman asked, grinning. "I hate to take advantage of a babe in the woods, but that is too good a chance at profit to pass up."

"Bet with you, Livingston? Do you think my mother raised any stupid children?"

"Hmmm . . . I'll not answer that." Livingston glanced at the chronometer on the wall. Its red glowing numerals read 08:31—except one of the LEDs had burned out and the numeral *one* was missing half its height. "You haven't got much time, Fred. The shuttle leaves in twelve minutes."

"Yes sir," Stassel said, gathering up his notes and a situation briefing tape to be studied on the trip to the satellite. He got up to leave.

"Not so fast," Livingston said, his bantering tone suddenly turned serious. "The guardian of our virtues wants to see you."

Stassel strained to keep his expression neutral as Livingston pressed a buzzer. Within a few seconds the cabin door opened and a dumpy, hard faced woman in the uniform of a UN Political Officer strode in. Stassel avoided looking at her. Colonel Irma Shetland was not one of his favorite people. She was a dour faced American with a nasty habit of delving into other people's confidential files. Stassel had spent an uncomfortable hour with her when he'd first come aboard the space station and he hadn't forgotten the experience. His face still turned red with anger when he thought about it.

"Good morning, Hauptmann Stassel," she said in her flat, emotionless voice.

"Colonel Shetland," he replied.

"I understand you are going into one of our hot spots. I am sure you will do well there."

He remained silent.

"It is my duty, however, Herr Hauptmann, to inform you of the

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penalty for violation of Peace Enforcer regulations should you decide to get involved without authorization."

"I have read the regulations, Colonel," he said.

"I hope you have. And I hope you remember that thirty-five years in a UN prison is a long time. So stay out of it no matter what your personal biases.

"Should you fail us in this," she said, pausing to let the import of her words sink in. "I will order Alphas Eight and Ten to laser you out of the sky. Got that?"

"Yes, Colonel," he said aloud. Silently he let the word he never dared say in her presence float to the surface. *Gestapo!* It was the worst insult he could think of.

"Then get out. I've got important things to do. Seems the UN is sending up another bigwig observer and I've got to hold his hand," she said.

Stassel hurried to a spoke entrance a hundred meters spinward from the briefing cubicle and punched for the lift. He frowned, considering Shetland's warning to him. He could see cautioning an American against taking sides. But why talk to him about it? He was nominally neutral in the dispute. Was his psychological profile so clear that she could read his thoughts? Was her warning merely a precaution, or did she have information that he wasn't as disinterested as he pretended to be?

Did she know about Alicia? Stassel shuddered at the thought. How could she possibly know? He was nearly positive that his personal file didn't list her. Could the Political Office be investigating him for suspected disloyalty?

The lift whooshed him upward toward the station axis. The familiar, ever changing Coriolis force as he approached the axis clamped his stomach muscles in a familiar vise. At the zero-gravity axis, Stassel kicked off and floated to the docking port at the station's north pole and through a flexible tube to the shuttle.

The shuttle was a standard orbit-to-orbit supply bus—three spherical sections assembled as though they'd been skewered onto a shish-kabob spike with a hydrogen fueled rocket at one end and the personnel cabin at the other. The shuttle was used to transfer personnel and consumables from the mid-Atlantic Space Station (and her mid-Pacific counterpart) to the orbiting Peace Control Satellites.

The Station was in synchronous orbit 37,000 kilometers above the equator so that it hung perpetually over thirty degrees west longitude. The Peace Control Satellites also orbited 37,000 kilometers out, but in two separate orbits, each inclined sixty degrees from the plane of the equator and from each other. Each satellite thus described a figure eight over a stationary strip of land, taking one day for the full traverse across the face of the planet. The satellites climbed to the latitude of Hudson's Bay in the north and dropped to the northern tip of Antarctica in the south. Spaced every ten degrees of longitude—or

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7500 kilometers apart—in their orbits, the satellites passed over every industrialized and developing nation on Earth four times daily. The seventy satellites and two space stations in orbit gave the UN's hundred gigawatt lasers overlapping fields of fire against any conceivable opponent. War was impossible.

At least, that was the theory.

"How you doing, Krauthead?" Smiley Burgess, the shuttle pilot greeted him as he floated into the cabin. Burgess spoke in a slow Texas drawl that Stassel found irritating. In fact, Burgess embodied most of the characteristics he found objectionable in Americans.

"I'm fine, Mr. Burgess," he said. He noted the six empty couches around the pilot. "Where are the rest of your passengers?"

"You're it, Friedrich old pal." He pronounced the name "Fred-rick," completely mangling the final 'ich' sound. "I guess the *Hun* wants to get someone he can trust into Alpha-Nine ASAP. I made a special trip to Beta-Nine yesterday. Took off Powell and substituted that chink, Hsin Liu, in his place. Funny thing about it, the flanking satellites all have Europeans, or Africans, or Asians in them. Not a single American, north *or* south, to be seen."

Stassel nodded absently. The Hun was General Heinemann.

"Strap yourself in, boy. This is going to be the fastest change of plane maneuver you ever did see."

Stassel took a couch and fastened the safety strap across his chest. He ignored the undocking maneuver and preliminary bursts of the attitude jets. He inserted the briefing tape into the couch reader and tried to concentrate on the mission.

After five minutes of futile efforts, he snapped off the viewer in disgust. He cursed himself under his breath. What was the matter? He didn't usually have trouble concentrating on a briefing. Why now? Maybe it was the irritation he felt with Burgess. Except he knew it wasn't. Burgess always irritated him. He was like a mosquito buzzing around in the blackness while you were trying to sleep. It wasn't the actual sting that kept you awake, but rather the anticipation. With Burgess you waited, wondering what he was going to say to rub you the wrong way next.

No, Smiley Burgess had never bothered him so much before that he couldn't concentrate on the mission at hand.

Colonel Shetland was the cause of his dry mouth, and sweaty palms, and inability to concentrate. Colonel Shetland and her not-so-stupid insinuations that his loyalty might not be completely with the Vaterland and the UN. In that instant of honesty, Stassel felt the memory that he had tried so hard to suppress boiling to the surface, plain for him to touch and feel, and smell.

It was the memory of Alicia.

Alicia Delgado. She of the raven

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hair and the piercing black eyes. The ready smile and the quick wit. The soft warmth, the quick passions, and the quicker temper.

There had been those who had laughed at them, the tall blond German and the short, dark Mexican girl. They had always looked upon Alicia and him as a joke—two fighter pilots in helmets and flight suits walking across the hot tarmac hand in hand, chattering lovers' nonsense to each other.

But Friedrich Stassel hadn't considered it a joke. Twice he had wiped smiles off the faces of fellow pilots—one German and one American—in back of the Officer's Club after the Friday night dance. Mostly though, he felt the haughty laughing eyes on the back of his neck and burned with anger that he was the butt of their jokes.

Alicia just laughed back, comforting him until he had no room for anger within him.

Stassel chewed his lower lip and gazed out the shuttle viewport at the silver points of light that were the stars. His mind flowed back to those first days of advanced fighter training in the cloudless skies of Arizona.

He had been stationed at Luke Air Force Base a month when he'd been invited to a party at the Base Commander's home. All the instructor pilots and foreign pilot-trainees had been invited. They made a sizeable group since Luke was one of the focal training bases of the United States' military assistance program. Halfway through the evening he'd found himself steered by a major's fat wife to a group of young officers in civilian clothes, gathered in a tight clump around a pretty, black haired girl. He barely noticed the men as they introduced themselves. His attention was rivetted on the girl.

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"Friedrich Stassel," he had stammered, taking the warm softness of her hand in his.

"Teniente Alicia Delgado, Mexican Air Force," she had said in a voice dripping velvet.

"You . . . a pilot?" he'd asked lamely. "I thought . . ."

"That I was a wife or girl friend?"

"Well, uh."

"A whore perhaps? Imported for this party to entertain the troops?"

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She laughed, the gaiety of her tone taking the sting out of her words. "What's the matter, Leutnant? Don't you think a woman can fly a fighter plane as well as a man?"

It was then that all the bright young Yankees had first laughed. True, in retrospect he could see they were laughing with Alicia. But at the time it had seemed they were laughing at him. He had beat a hasty retreat with his backbone locked ramrod straight and his ears turning bright crimson. Never again would he speak to the verdammt bitch, he vowed.

A week later they were lovers.

Stassel sighed as he watched the back of Burgess' head while the American was busy with the course computer checking over the next delta V burn. He tried to think about the mission, but the pull of Alicia was too strong. His thoughts were drawn to their last leave together.

It had been late spring, a time when the mercury began to climb dramatically on the deserts of Arizona. He and Alicia had managed a week's furlough from training. The occasion was an expedition to the Grand Canyon with two other officers and their wives. Captain Hardy, Stassel's instructor, had promised to show them Havasu Falls, one of the last unspoiled wonders of the world. Unspoiled because it was accessible only by backpacking or horseback.

Stassel remembered the hike down only as an uncomfortable six hour walk. The heat was building by the time they departed Hualapai Hilltop, a ledge carved out of the side of the canyon a thousand meters in elevation and twenty kilometers distance from the falls. The hike through dry creek beds became more miserable by the hour as the temperature soared.

Alicia didn't seem to mind the heat at all. She wore shorts and a close fitting halter top for comfort. Her dark brown skin quickly shone with a fine layer of perspiration as she stepped out quickly, her hiking boots crunching the loose gravel of the trail underfoot.

Fifteen kilometers down the trail they came to the Havasupai Indian settlement. A village of neatly painted frame houses set in a wide spot in the canyon, it was like stepping into a Garden of Eden from the wilderness. A cool creek bubbled through the village and soothed their hot, tired feet. Another five kilometer walk brought them to the falls.

Stassel smiled as he remembered the falls, a white torrent of water rushed over a sculptured cliff in a drop that seemed unending. The water finally pounded down with a roar into a sparkling mist and a pool of azure-green. In the pool, built up over thousands of years, were limestone terraces over which the waters of Havasu Creek bubbled in a dozen cascades.

They stayed in the campground at the base of the falls for a week. He remembered the evening of the last day before starting the grueling hike back to civilization. It had been a Thursday and the campground was nearly deserted.

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At dusk, he and Alicia had decided to go for one last swim in the pool at the base of the falls. They had staked out a secluded spot on the far side of the pool and stripped off their clothes, not bothering with suits. The few other swimmers were far away and predisposed to mind their own business.

Stassel remembered the icy bite of the water as he dove in. Fed by a mountain stream, the chilled water of the pool momentarily took his breath away. And then there had been the warm touch of Alicia as they embraced and kissed. They had sunk beneath the surface of the pool, finally separating to gasp and sputter their way to the surface. And afterwards, he remembered the warmth of her as they lay together on a towel, shivering in the last light of day.

"This is paradise, Friedrich," she had said, propping herself up on one elbow, her face barely visible in the oncoming gloom. "Why not stay? No one would miss us. The world no longer has any need of soldiers. So why do we bother?"

"Because it is expected of us," he had replied.

"Oh, our duty then?" she asked.

He nodded. "Our duty."

"I hate that word," she said, scowling. "To whom do you owe your duty, my love?"

The question surprised him. He hadn't really considered it. Finally, after a moment of silence, he said, "My father, I guess. I come from a long line of military men. He would be disappointed with me if I were not a soldier too. After my obligation to the Luftwaffe is over, I plan to try for space. My father commands a ship in space, and it's his dream that I follow after him. How about you, my dark haired Alderin?"

"Alderin?"

"It means eagle. Aguila in Spanish, I think. Why have you taken up the male sport of war?"

"Because it was expected of me also. And because I am the first woman pilot in the history of the Mexican Air Force. There are those in Mexico City who would have our backward nation join the twenty-first century. I am their token for progress. As such, I dare not fail."

"And it means a lot to you?" he asked.

She shrugged. "I suppose. But when I see this beautiful place around us, I sometimes wonder. Are all of mankind's concerns more important than a single minute spent in this paradise?"

"I don't know. Tell me if you ever find out."

"We should do something to memorialize this moment, Liebling."

He had raised his eyebrows in surprise, forgetting that she couldn't see them in the dusk. "Liebling, is it? You *have* been studying. I suppose I could carve our initials in a tree . . . Oof!"

His ribs ached where she had punched him.

"*Monstruo*! You do and I'll carve my initials in you." She laughed, a high sparkling sound nearly drowned

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out by the roar of the falls. "Besides, I am getting cold. Perhaps we can think of something in our tent to celebrate the moment . . . and to keep each other warm."

"What are you smiling at?" Smiley Burgess asked.

Stassel was suddenly pulled back to the present. The shuttle pilot had squirmed around in his seat to stare at his passenger. Stassel realized that he had been smiling and the expression quickly turned to a frown.

"A girl, I'll bet."

"What?" Stassel asked.

"That expression on your face. I'll bet you were thinking about a girl."

Stassel nodded. "A girl I met while training in your homeland. She was a pilot, too."

"Love her?"

Stassel nodded again.

"Well then, why aren't you married to her?"

Stassel looked into his laughing eyes, seeing all the laughing eyes of his past. He suddenly felt a knot in the pit of his stomach, wishing that Burgess would go away. "She was killed two weeks before graduation in a crash. Her plane went down in a desert canyon and burned on impact."

Burgess' sneer was instantly gone. For the first time since he had known the shuttle pilot, Stassel thought he saw compassion in those eyes.

"Look, Fred, I didn't know. I'm sorry."

"That's alright. I shouldn't burden you with my problems. Besides, it was a long time ago. Before I joined the UN."

The pilot cleared his throat. "Uh, get your things ready for transfer. We'll be coming up on Alpha-Nine in about twenty minutes."

Peace Control Satellite Alpha-Nine floated into view fifteen minutes later. Like all such, it was constructed in two pieces. The thirty meter long cylinder that housed the hydrogen-fluorine gas dynamic laser and its fuel tanks was attached by a hundred meter long umbilical to a sphere painted in a haphazard pattern of light and dark checks. The ten meter sphere was festooned with antennas, telescopes, and the more arcane paraphenalia of a dozen different kinds of information sensors and communications devices. The doghouse, as the sphere was called, was crammed solid with hardware that acted as the satellite's eyes and ears and brains. The umbilical—floating limply in space as the shuttle moved in slowly for a hard dock—connected the two halves of the satellite together and isolated the laser module with its sensitive aiming mechanisms from extraneous perturbations. For instance, the force of a hundred ton shuttle coming to rest in the doghouse's docking collar, or the effect of the satellite commander doing his morning calisthenics.

The satellite living quarters were located at the end of the doghouse arbitrarily labeled "top." They were tiny, consisting of a control center, shower-bath, and combination galley and recreation-bunk room. The crew

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quarters of a PCS didn't have to be large. The satellite commander was the only crewmember. Even so, the UN had a perennial problem keeping seventy satellites manned with reliable people on a one-week rotation schedule. And what the satellite commander lacked in numbers, he more than made up for in firepower. At his fingertips were the controls to a hundred gigawatt laser, powerful enough to strike down any opponent. And if needed, he would be backed up by the power of the space fleet.

The shuttle nudged the satellite docking collar with a dull thud followed by the hiss of compressed air being vented. Stassel unstrapped from the acceleration couch and floated to the locker where his vacsuit was stored. Burgess busied himself computing the return trip to the space station.

In ten minutes Stassel was suited up, with helmet in hand. He stood beside the open hatch to the transfer tube. "Thanks for the ride, Smiley," he said, holding out his gloved hand to the pilot.

Burgess took it hesitantly. "Bye, Fred. See you next week." Burgess looked down at the deck, hesitant. "Look, I'm sorry if I said anything . . . well, you know . . ."

"Forget it," Stassel said. "It was a long time ago. I'm over it now." He knew as he said it that it was a lie. Thinking about Alicia on the trip out had ripped open the emotional scab he had secured on the wound of losing her. All the old emotions were once more raging within as fresh as the day she had died.

He hoisted his helmet and snapped it down over the neck ring, twisting it into place until the vacuum seals engaged. The familiar dirty sock smell of his suit engulfed him. The vacsuit was merely a precaution. The tunnel to the satellite was pressurized.

Stassel kicked off up the tunnel, towing his personal effects behind him in a net bag. As he reached the other end, the hatch before him popped with a soft sighing sound as the pressure equalized.

Raj Bahmani, Indian Air Force, stood on the other side of the tiny airlock. He was suited up and anxious.

Stassel twisted off his helmet and lifted it free. "Hello, Raj," he said, shaking hands with the short brown officer.

"Hello, Fred," Bahmani said. His Cambridge accent was as incongruous as the turban he wore. "Where's Robertson?"

"Brig. I'm his backup. Anything to report?"

"Have you heard about Sequoia National Park?"

Stassel nodded. Sixty hours earlier a Mexican jumbo freighter masquerading as a commerical airline flight had broken through the Pacific Air Defense Indentification Zone. Their target had been the giant redwoods. A thousand tons of highly toxic herbicides were dumped on the ancient trees. Reports from the area indicated lethality had reached eighty percent in

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some stands of trees.

"I picked up some Ecocrat orator on my last pass over the States," Bahmani said. "He was haranguing the faithful, urging them to rise up and smite the greasers. Things won't hold together much longer, I'm afraid."

"I'll keep an eye on it," Stassel said. He snapped to attention, his boots held to the tetrahedral grid set in the deck by mechanical clamps. He saluted the Indian. "I relieve you, sir," he stated formally.

Bahmani did the same. "The station is yours to command, sir," he replied, completing the formula. "Good luck, Fred. You are going to need it."

Then he was gone head first down the transfer tube. Stassel shut the hatch behind him and began peeling off his suit. Minutes later, two metallic clicks and a muted clang announced the shuttle's departure.

Stassel grabbed a sandwich from the galley and munched thoughtfully as he studied the tactical briefing tapes and the situation display Bahmani had left in the control center. The Indian was right. Things didn't look good.

Stassel lay in the command couch of PCS Alpha-Nine and sipped tea from a hot squeeze bulb. The tea left a bitter aftertaste in his mouth. Before him were a dozen screens over which his eyes roamed carelessly. On the large central screen was a view of all of the Mexican State of Sonora and small patches of the Sea of Cortez and the southernmost region of Arizona. Around the edge of the big screen were smaller screens, each with a different view. In one he could see the long form of the satellite laser module, half in sun and half in dark, a semicylinder that appeared stationary against the ever changing image of the planet. In other screens he saw views transmitted from low orbiting reconnaissance satellites, zipping in a north-south orbit just beyond the limits of atmosphere. He glanced at the position map, noting that Alpha-Nine had just crossed the equator headed north. For the next four hours, Stassel would be over the crisis area and would be subjected to the awful strain that can come from harboring mixed loyalties.

On the one hand, he was an officer in the Peace Enforcers and sworn to uphold the peace and the rulings of the Security Council. On the other, what if the goals were mutually exclusive? The S.C. was impotent, a mere squabbling band of grasping politicians who were going to let everything he and so many others had worked for be flushed down the drain. Stassel liked Mexicans— How could he help but like them? Alicia had been one. Like many Europeans, he found Americans to be overbearing, brash, and insensitive boors. In fact, they were a nation of Smiley Burgesses.

But this was one time when they were the injured party and the underdogs were in the wrong. It was anti-Americanism in the Security Council that emasculated the Peace Enforcers. Stassel scanned his screens and shuddered at the thought of what he would

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do if the Mexicans chose the time when he orbited overhead to step up the pressure. What they were doing was wrong, and it stuck in his craw to have to sit back and let them get away with it. Better for everyone if the next Mexican raid came during Hsin Liu's watch when Beta-Nine was in the northern hemisphere.

What about it, Alicia? Would you have destroyed Carlsbad over a sugar beet? Could you have brought yourself to follow orders and kill the thousand-year-old redwoods? How about Lake Mead? After all, it is a manmade lake rather than a natural one. Does that somehow make it right?

Alicia did not answer. In Stassel's opinion she didn't have to. She had loved the beauty of nature and to think she would have had anything to do with its destruction was ludicrous . . . at least, to him.

An hour later he licked tongue over dry lips and watched a death duel take place ten thousand meters above the twin border towns of Nogales, Arizona and Nogales, Sonora. A dozen planes wheeled, and stooped, and dodged in a deadly dance of sputtering guns and sprinting missiles. Stassel watched the fight through the eyes of a low level reconnaissance satellite. He followed the progress of the battle by means of an array of sensors ranging from infrared scanners to side looking radar. The quick thrusts and parries of the combatants were spelled out in glowing electronic symbols on the face of the main screen.

Stassel inhaled sharply as the tiny dot of a missile merged with the image of a plane. He tasted bile and smelled the stink of involuntary fear. His eyes burned from too little sleep and too much time spent in the command couch in the last seventy-two hours. On the screen the wounded plane began its death dive Earthward as the missile exploded under one wing.

Stassel sighed heavily and released the couch armrest from his white knuckle grip as he turned his attention away from the battle. Monitoring its progress was the job of specialists aboard the space station. He had another job to do.

As deadly as it was, the dogfight was a sideshow. Pilots were fighting and dying down there in a militarily senseless engagement. Six Mexican fighters had crossed the border to attack a like number of American planes. They had no hope of success. Even now the American reinforcements were swarming south to help their brethren. But the men who had ordered the attack were not stupid. Their actions to date had been near brilliant in their reading of the international situation, as evidenced by the knots which they had managed to tie the Security Council into. So, their purpose in initiating hostilities had to be something more than a straightforward provocation.

The dogfight was obviously a diversion. The Mexicans knew it, the Peace Enforcers knew it, and the Americans knew it.

Peace Control Satellite Alpha-

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Nine, orbiting over 10 degrees north latitude, 110 degrees west longitude, scanned the battleground with powerful sensors. The satellite's electronic brain sorted through a forest of information looking for that one telltale return that would indicate the presence of an unseen intruder. The bandit would be low and fast, and incorporate every concealment device possible. But it had to be there. No other explanation of the air battle raging below made sense.

Suddenly there it was in the lower right hand corner of the big screen. A flickering blue dot with a string of green symbols beside it. The raider was on the deck, hugging the ground as it screamed at Mach 1 through a series of mountain passes and dry river valleys. It followed a path that offered the maximum in concealment for a low flying airplane. In fact, Stassel noted with grim satisfaction, it was much the same course followed by two generations of aerial drug smugglers. Having spotted the raider, Stassel ordered the whole array of sensors onboard Alpha-Nine and the string of reconn satellites to focus on the speeding dot of titanium and high alloy steel.

Then he sat back nervously to wait. The computers would record all the information they could glean from the mass of data being collected. From that information they would be able to guess the raider's armament, his probable future course, and with luck, his target.

Three minutes of data collection confirmed his worst fears. The intruder was trailing a miniscule wake of ionized particles. In itself it meant little, but knowing that the situation was getting as desperate in Mexico City as Washington, he had little doubt as to the cause. Having trained in similar fighters, he could picture the red tipped missile slung at the midpoint of each wing, its high explosive warhead cladded with radioisotopes harvested from commercial power plant waste. A sheath of metal that would become deadly radioactive shrapnel fragments when the missile exploded. If the raider managed to launch his weapons, the resulting explosion would contaminate an area five hundred meters in radius and the contamination would remain dangerous for decades. Any spot where the explosion occurred would be effectively defiled for the remainder of the lives of everyone living.

Stassel broke into a cold sweat at the thought. To use such a weapon at Carlsbad had been bad enough. But a cavern did contain the fallout. Most of the non-American press had gone to great lengths to point that out in their stories on the raid. Third Worlders had used the point with telling effect in their defense of the Mexicans in the Security Council. But to use an isotope warhead in the open air was something else again. World opinion would never forgive them for it.

Stassel punched a communicator key with shaking hand. "Hello, Control, this is Alpha-Nine. I have a bandit at grid Bravo-Gamma-3-8. He's hot. I repeat, he is hot!"

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"We have him, Alpha-Nine," the Combat Center Operator aboard the space station replied. Stassel thought he detected a tense undertone in the man's voice. It was nothing like the bored acknowledgement he usually got from the CCO. *He must realize that this may be the spark that puts civilization to the torch*, Stassel thought.

A fanshaped area shaded in blue flashed on the screen, with its apex at the blinking blue spot that was the raider. The satellite brain had computed the probable flight path of the bandit. Spotted across the face of the big screen were a scattering of red dots with tiny vector arrows pointed down. These represented the position and course of American planes drawn out by the dogfight over Nogales. The intruder continued his zigzagging northern course. The Americans were seemingly unaware of his presence as yet. Their positions showed they were in rough search formation rather than having shifted to the more purposeful attack order. With the establishment of the Peace Enforcers, the UN had taken control of all the surveillance devices beyond the atmosphere. It put the various nations at more than a small disadvantage.

Stassel extended the probable flight path of the raider. As he did so a white ellipse formed on the face of the screen. This was the computer's estimate of the target area, based on the raider's speed and fuel situation. The ellipse was centered on the Grand Canyon National Park.

Stassel cursed the depths of stupidity to which human beings could be driven by injured pride. He reached for the transmit button. "He's after the Grand Canyon, Control," he said with a quaver in his voice. *Gott in Himmel, let me be wrong!* he thought as he punched for a list of possible targets in the Grand Canyon.

The list was displayed on one of the auxiliary screens and was relatively short. The Grand Canyon was a huge place, a fact that had been drilled into him that long ago day when he'd hiked down from Hualapai Hilltop. It was far too large an object to be held hostage in this game of environmental blackmail. Even a full fledged nuclear weapon would have had trouble leaving its mark. So an aircraft armed with an isotope warhead would be aimed at a smaller target, an enclave within the greater National Park. And first on the list of probable targets, just as he knew it would be, was Havasu Falls.

Stassel cursed the day he had decided to follow in his father's footsteps. He cursed the father of that unseen, misguided patriot who was being bounced around by wicked thermals and wind shears 37,000 kilometers below him. But most of all he cursed the Security Council and the UN in general for letting him get into this situation.

They weren't after some picture in a travel brochure this time, a place he had never been and would never miss. They were after Alicia's place! The beautiful azure-green pool with its indescribable waterfall would become

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the deadly center of a radioactive cloud within minutes. No more would lovers swim in the icy water of Havasu Creek, to lie in the gathering dark and compete with the roar of the falls as they talked of the future. Possibly the last place on Earth that had yet to see a parking lot would be no more.

And he had orders to let it happen.

Take no action without orders . . . Wait for the Security Council to vote censure before we move . . . It's your duty to obey your superiors, Friedrich. You keep that in mind. (Yes, Father) . . . I need men in orbit who can keep their heads and do their duty. Can you? . . . (I think so, Herr General.)

All the authority figures he had ever known poured out of Stassel's memory. There had been his father, the proud spaceman. There had been his science teacher in die gymnasium ("Excell at everything you do, young man"). There had been his first unit commander after he had returned to Germany from training in America. Major von Brandt had helped put him back on the track after Alicia's death. It has been von Brandt who had steered him toward the Peace Enforcers.

But all of these stern images were suddenly overshadowed by a quiet, black-eyed face that stared up at him as she had done in life. *"It is wrong, Friedrich. Don't let the misguided fools do it."*

He made his decision and punched to energize the controls for the laser.

The long cylinder that was the laser module rotated on an auxiliary screen as raw, unfiltered sunlight flashed brilliantly from its flanks. On the main situation screen, a tiny black cross inside an aiming circle appeared and moved toward the blue dot of the raider. It had traversed half the distance to the bandit when the emergency communicator alarm erupted in his ears. He hurriedly shut off the alarm with his left hand while still controlling the motion of the laser with his right.

Colonel Shetland's angry face appeared on one of the small screens. "What the hell do you think you are doing, Stassel?"

"What, Colonel?" he asked, not taking his eyes off the target.

"Why have you activated your laser?"

"Activated my laser? You've got to be kidding. All my dials show normal here," he said. In spite of himself, he couldn't help grinning at the thought of Colonel Shetland's face turning red with rage. He stole a quick glance at the screen and gasped. She had passed the red stage and was well on her way to purple.

"My God, Stassel, shut that damned thing down!"

He suddenly gave up trying to bluff her. She had too many readouts that told her what was going on to be fooled by his denials. *Damned Gestapo and her spy cameras!* he thought.

"Why should I, Colonel?"

The cross was centered on the raider's image on the big screen. He locked the laser on target and set the pumps into operation. He imagined he

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could hear their high pitched whine in the laser module as they precharged the combustion chamber with fuel. Of course, he was wrong. The umbilical that held the two halves of the satellite together didn't transmit sound.

"Because it is a direct order from a superior officer!" she screamed.

"Not good enough, Colonel. Think up some other reason."

"Because you will be starting World War III."

Suddenly indecision swept over him. Did he alone have the right to make such a decision? Could he risk the world just to save a bit of natural beauty that happened to have personal significance? What about all the people who had never seen Havasu Falls and could care less? Didn't they deserve a vote too?

Shetland saw the indecision on his face and knew that she had won. Her manner was suddenly calm, her voice soothing. "Come on, Fred. Shut down. You are minus on your sleep. If you were thinking clearly you would never even consider this."

The big screen suddenly blurred in front of him as tears welled up in his eyes. "But they are after Alicia's place," he pleaded. "I can't just let them destroy it without doing anything to save it."

Shetland looked perplexed, running his service record over in her brain. Then recognition showed in her eyes. "Oh, the incident during your training. The girl who was killed in the accident," she said, her eyebrows furled in bewilderment. "Is that what this is all about?" She threw back her head and laughed. It was the first time Stassel had ever heard the sound issue from between her lips. "Don't tell me you are ready to blow up the world because of some long-dead girl friend?"

"*Do you know a better reason?*" he screamed, a red rage blocking out all else as his finger stabbed at the firing stud.

An invisible pulse of light erupted from the end of the laser module. And 37,000 kilometers below a pencil beam of light sheared through the tail surfaces of an aircraft skimming the surface of a dry desert arroyo. There was no time for the unsuspecting pilot to react. Before he could comprehend what was happening, he was the center of a cartwheeling mass of scrap metal and flame and a towering cloud of dry, brown dust.

Stassel leaned back in his couch and shivered, his hands shaking out of control. There would be no turning back now. If the world wanted to blow itself up, he had just given it a good excuse. He turned to Colonel Shetland, still staring out of the screen at him, horror on her face.

"You've just killed us all," she whispered, unable to find her voice.

"Maybe," he replied, feeling washed out and listless, but at peace with himself for the first time in years. "But maybe I just saved us, too. You can come get me anytime, Colonel. I'll surrender peacefully."

Jan Pieter Heugens sat once more

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behind his desk and watched storm clouds gather over the New York skyline. This storm seemed somehow less gloomy than the one a week before. It was suddenly a bright new day. That morning he'd caught himself whistling in front of the bathroom mirror while shaving. It had been years since he'd done that. Not since Katrina had died, in fact. The intercom on his desk buzzed.

"General Heinemann is here to see you," his secretary said. "And President Warren is reported to be in the building."

"Fine, send the general in now."

The door opened and a man with close cropped, greying hair stepped through into the office. He wore the black and silver uniform of the Luftwaffe and the blue beret of the UN Peace Enforcers.

"Good to see you again, Willy," Heugens said.

"No more 'Bernard,' Mr. Secretary-General?" Heinemann asked.

"I think Mr. Bernard can safely die now, don't you?"

"What is the purpose of this meeting? I've got urgent duties aboard Atlantic Station. As you may well guess, things are a bit unsettled right now."

"It won't take long, Willy. In fact I am sure . . ."

The intercom buzzed again. "The President is here, sir."

"Send him in, Miss Callahan."

Heugens stood and crossed to the door as a photogenically handsome middle-aged man entered. Heugens thrust out his hand to have it grasped in a firm grip. "How are you, Mr. President?"

"Well. And you, Mr. Secretary-General?" Heugens noted with amusement that Warren stood half turned for the benefit of the television cameras in the outer office. Then the door closed, cutting off the glare of the media lights, and the pose was suddenly gone. "Kind of public for a meeting of a cabal, isn't it?"

"Don't worry," Heugens replied. "I am also meeting with Ambassador Torres this morning. We are going to discuss 'the international situation,' as it is called. Mr. President, I would like to present General Heinemann of the Peace Enforcers."

"The man we have to thank for this happy state of affairs?"

Heinemann stood to attention and clicked his heels. "Not I entirely, sir."

"Ah yes," the President said. "Where is the young captain who fired the shot heard round the world? I wanted especially to meet him."

General Heinemann shifted nervously from foot to foot. "I'm afraid that is impossible, Mr. President. Colonel Shetland has him locked up aboard Atlantic Station. She is bound and determined to see him shot."

The President frowned. "You aren't going to let that happen, are you?"

"No we are not," Heugens said. "I'm afraid Hauptmann Stassel's career in the Peace Enforcers is ended, but we will not waste him. He's too valuable a man for that."

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"Good. He should be rewarded beyond his wildest dreams. Without him the Council would still be stalemated. By the way, when is the vote?"

"This afternoon," Heugens said. "Torres is so incensed that he demanded it with no delay. Of course, he doesn't know that four of the delegates who have been making noises of sympathy at him are my agents. So he will be greatly surprised by the vote."

"You are sure we will win?"

"Positive, Mr. President. When it came out that the Mexicans were using isotope warheads, their goose was cooked. It's all over but the shouting."

Warren nodded, a half-smile on his lips. "That's great. Tell me something, Mr. Secretary-General. Just how did you do it?"

Heugens turned to the General. "Want to tell him, Willy?"

The General nodded. "I've known Stassel's family for years, Mr. President. I served with his father aboard a German cruiser before the UN took over the national space navies. Stassel's father was something of a . . . how do you say it? . . . a maverick. He was the type of man who did his duty as he saw it and worried about following orders later.

"I figured that Stassel had a lot of his father in him. So I called him into my office and gave him my good-Germans-always-follow-orders speech. It bothered him. I could see it in the way he squirmed in his chair. Meanwhile, the S-G infiltrated one of his spies into the Mexican hierarchy and suggested the attack on your national monument that had the most meaning to Stassel. From there on, nature took its course."

The President looked doubtful. "Come on, General. I've seen the tapes. There was a moment there when this Colonel Shetland of yours had him on the ropes."

Heinemann laughed. "Poor Irma. She is one of those who see conspiracies everywhere she looks. When she saw that Stassel had activated his laser, she conjured up visions of some huge international conspiracy."

Heugens chuckled. "She was more right than wrong, too. Otherwise the three of us wouldn't be here."

The General nodded. "True, but Stassel didn't know that. So Shetland got him calmed down at the last second and found out that he was ready to shoot, not because of a conspiracy, but for this girl he once loved. The incongruity of it was too much for her. She burst into an explosion of laughter . . . almost an attack of relief. It was exactly the wrong thing to do. Stassel's psychological profile shows he has an unreasoning fear of being laughed at. When Irma broke down, it was just like thrusting a dagger into him. He fired that laser in angry reflex, without thinking."

Warren smiled. "Remind me to send Colonel Shetland a thank you note in about twenty years."

Heugens shook his head slowly from side to side. "I don't think she would appreciate that, Mr. President." ■

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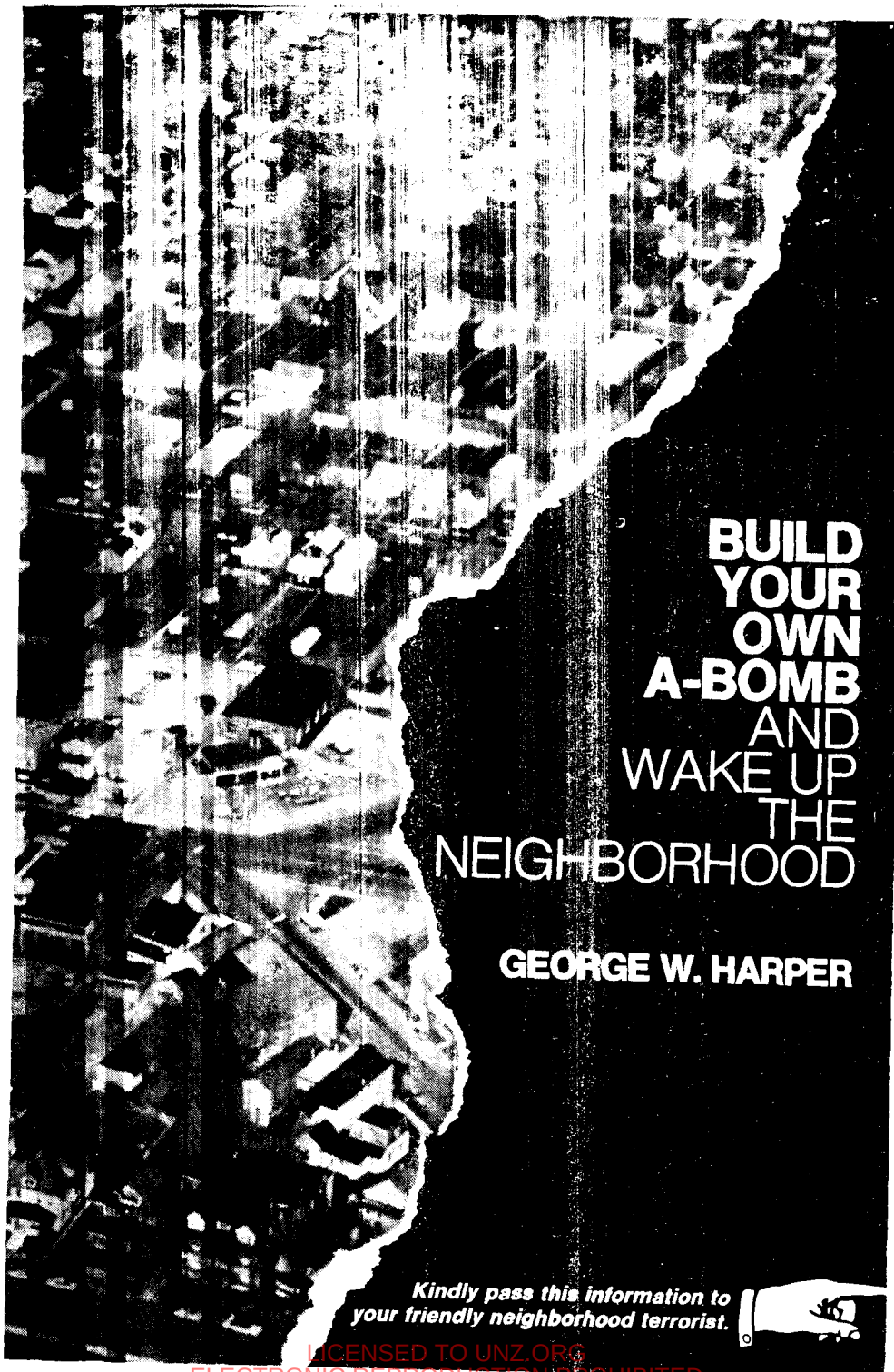

BUILD YOUR OWN A-BOMB AND WAKE UP THE NEIGHBORHOOD

GEORGE W. HARPER

Kindly pass this information to your friendly neighborhood terrorist.

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Some months ago the newspapers carried an item about a physics student who had designed his own A-bomb and was now in hiding lest terrorists put the snatch on him and force him to reveal the secret of a do-it-yourself bomb. A few months after that there was a TV item on "Barney Miller" where the feds impounded a private little A-bomb, which coincidentally just happened to have been put together by a college student.

Now we sympathize with the fears of students who feel themselves jeopardized by their knowledge of exotic or arcane arts and we would hate to think they cannot walk the streets safely, simply because some terrorist might seize them and compel them to serve as unwilling agents of mass destruction. And since the best guarantee of their safety is to make the knowledge so public that no terrorist would even bother to impound some other person to do the job, we have decided to provide a detailed, step-by-step method of constructing an A-bomb. It is so simple that anyone who chooses . . . even if he only went to the fifth grade . . . can build his own. This way the undergrad students need no longer walk in fear and trembling lest they be abducted by crazies and they can all rest a little more peacefully. So if any of you have friends who feel like going into the A-bomb business please turn them on to this article and leave the frightened college students alone.

The theory of an A-bomb is simplicity itself. Merely take two masses of the right material . . . usually either uranium-235 or plutonium . . . and hold them tightly together for a long enough period of time. Everything else occurs on its own.

The basic initial problem is determination of the minimum quantity of fissile material needed to provide the bang. In this, of course, the technological expertise of the manufacturer necessarily plays a role. If you are an advanced engineering student with access to exotic materials and the most advanced triggering devices you can probably manage quite comfortably with as little as twelve pounds of U-235. For our purposes here we will assume you are not quite so capable and so will focus our attention on the sort of bomb you can construct in an ordinary home.

For this type of bomb the amount of U-235 required should be in the neighborhood of thirty pounds . . . about the size of a baseball. Employing only easily acquired material, this type bomb should be capable of demolishing everything within a radius of one-third mile from ground zero and causing extensive damage out to a distance of two-third mile. Lethal exposure to radiation could occur within a radius of one and one-quarter mile and people downwind of the fall-out might be sickened up to a distance of forty or fifty miles.

All in all, it would seem a most satisfactory device which, if detonated in New York City, ought to kill perhaps 250,000 people and injure another 400,000. We believe this

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should be more than adequate for the average terrorist and very possibly even satisfying to a general . . . providing it was put in the right place.

But we would also have to caution against the employment of masses of U-235 exceeding some forty-five pounds. Beyond that limit the problem of putting the pieces together in a timely and efficient manner becomes too great for amateur mechanics. It would be unfortunate if you started building one of these things and it went off in your face before you finished it. Our personal preference, therefore, would be a total mass of around thirty-six or thirty-seven pounds. This will provide a comfortably large bang while also leaving a certain margin for errors of calculation in constructing the gadget.

Once an adequate amount of material has been put together in one place there is a need to keep them there for a period of about half a second. The method of achieving this half-second delay is the main problem confronting the manufacturer. Whenever two masses which together will create a critical mass happen to get too close they begin a rather violent interaction. The immediate effect of this interaction is the appearance of massive quantities of energy . . . all pushing outwards. In a small fraction of a second this energy will fling the two masses of U-235 apart. The sole result of such an unconstrained approach is a *squib explosion* . . . one which will make a mess of the immediate area but will scarcely be felt a few hundred feet away. It is assumed any self-respecting terrorist would wish for something more spectacular so our immediate task is one of devising some method which will keep the two masses of U-235 together long enough to let bigger things happen.

Over the years scientists have developed a number of methods for bringing U-235 masses together and holding them there long enough for an explosion to occur. One of the first such methods, for example, required an *implosion* to trigger the final *explosion.* In this method a mass of loosely compacted U-235 was surrounded by quantities of high explosives. At the appropriate instant the explosives were detonated, compressing the U-235 and holding it in position long enough to complete the cycle . . . or at least this is the sketched method which appeared in the newspapers during the Rosenburg trial. We believe it probable this was not the whole story however. Even a loosely compacted mass of U-235 would be entirely too hot, both radioactively and thermally, to be handled with any comfort. More likely the U-235 (or plutonium) was first machined into several segments which together would approximate a sphere. Each segment would then be placed in a single conduit, with a graphite or other moderator separating the various segments. At the appropriate instant a simultaneous detonation of several explosive charges would propel the different segments down their conduits to an explosion chamber.

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While this technique is theoretically quite workable, we feel it would be entirely too difficult for terrorists to construct using home-made equipment. Achieving the sort of accuracy needed to bring all elements of the U-235 together at the precise instant needed to obtain a satisfactory explosion implies a 'fail-safe' technology one or two orders of magnitude greater than most terrorists can hope to achieve. For this reason we have resolved on a simpler approach.

We feel a quite acceptable device can be constructed providing the terrorist has access to a two-story building with basement, two sticks of dynamite (or the equivalent in black powder or TNT), fifteen sacks of cement, twenty cubic yards of sand and gravel and about a week to work. Total cost, apart from building rental, should be in the vicinity of $3,000 . . . perhaps a bit less if second hand or surplus materials are used. The final requirement, which is a bit more difficult to come by, is the necessary quantity of U-235 or plutonium. We will touch on this matter later, but for the time being we will merely assume the U-235 is on hand.

Taking things in order, the first step is to make certain the U-235 is divided into two or more approximately equal masses. Rather obviously, it was not all together when brought into the house, so we will assume it arrived in several small packages. The immediate task is to get it into a form ready to become part of an explosion. With two masses, each weighing eighteen to eighteen-and-one-half pounds, it is necessary to machine a pair of matching hemispheres. This requires an acetylene torch.

Uranium has a melting temperature of approximately 3760°F. An acetylene torch has a theoretical flame temperature of 4770°F, and even though this theoretical limit is not reached, the flame temperature is still comfortably above the melting point of uranium. Preferably you should first construct a small kiln out of a few dozen fire bricks and employ a bellows to add air to the system, but with a bit of patience (and some luck since uranium happens to be explosively flammable) the acetylene torch ought to be entirely adequate.

As the uranium melts it is allowed to flow into a hemispherical depression created out of fire clay of the sort obtainable in any ceramics outlet. Once the first hemisphere is formed and cooled it can be moved away from the kiln and the second hemisphere manufactured. It must be noted that in doing this it is highly desirable to stay well clear of the area. Uranium has a number of unpleasant characteristics. If you happen to be in the same room while it is being melted down you are certain to inhale some of the radioactive gasses . . . More than enough to have a decidedly adverse effect on your life expectancy; possibly reducing it to as little as a few hours.

Assuming that as a terrorist you are not overwhelmingly interested in personal survival, these matters can be

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neglected providing you are willing to hurry a bit. Otherwise, to smelt the uranium we would suggest you employ some reasonably good servomechanisms, about five tons of lead and a distance of some fifty feet or so between you and the U-235 being smelted. Given this sort of protection there should be no problem, providing appropriate peripheral precautions are taken.

Keeping the two chunks of U-235 well separated from one another (and in a lead casket to prevent excessive stray radiation while you are about the business of completing the bomb), we next cut a hole from the second floor down to the basement. A couple of lengths of black iron pipe are now inserted and joined so we have a three-inch cast pipe running from the basement up to the second floor. This should give about a twenty foot total length.

Probably it would be a good idea to put about a six-inch plug of cement in the base of the pipe, but if your floor is very solid and the house rests on rock this may be dispensed with. Before lowering the pipe down onto the plug we put one of the U-235 hemispheres, flat side up, atop the plug. The pipe is then seated and the first half of the bomb is complete.

To assist in providing confinement we next fill the basement with a mix of sand, cement and gravel, mixing thoroughly with water from a hose in the process. Since this is to be a one-time job there is no need to make a real production of the matter. Slopping it together will do almost as well as trying to be meticulous about the whole thing. What we are really interested in is having enough external resistance around the pipe to prevent it from rupturing and scattering uranium around the basement before having it go boom. Even a semiliquid cement-sand-gravel mix will be adequate for the purpose and any additional strength will be largely wasted.

We would also suggest a few sacks of cement and sand be placed around the pipe where it passes up through the first floor. This is probably not really necessary but a little extra containment may well pay off in a higher yield. When finished, this completes the receiver element of your bomb and the structure should look about as sketched in Figure 1.

Construction of the firing element is a trifle more difficult. The idea is to take the second U-235 hemisphere and place it at the top section of the pipe so it can be fired downward onto the receiver element. While the theory is simplicity itself, there are certain inherent difficulties. For one, it would be somewhat disconcerting if the trigger hemisphere slipped during the final positioning. Lacking anywhere else to go, it would promptly slide down the pipe and then come back up again. This would be self-defeating. Not only would you be dead, the publicity would be unfortunate. Terrorists who succeed only in blowing themselves up are merely amusing and not at all terrible.

Our design, as given in Figure 2, is

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probably the simplest effective approach yet devised. A thin wire screen . . . the same sort used to keep out flies in the summer . . . is placed atop the bell of the pipe and then stuffed loosely down into it, taking care that three or four inches of the screen remain outside the lip of the bell. A four-foot additional section of pipe is then seated on top of the bell and welded firmly into place. For additional strength we would also suggest one or two small holes be drilled into the joined sections of the pipe and steel pins inserted.

Next you take a three-foot length of 2½ inch copper pipe and fill it with molten lead. The second hemisphere of U-235 is then pinned into a form-fitting recess molded at the base of the lead while a steel screw-rod is drilled into the opposite end of the cylinder for a distance of perhaps a foot. The total mass of this firing unit will be between eighty and ninety-five pounds, depending on the amount of lead employed and the length of trigger pipe used.

A threaded cap is then screwed onto the pipe (note the need to tap threads onto the pipe before affixing the cap). When the cap is loose enough on the threads that you can screw it on and off by hand it is then removed and a hole large enough to accommodate the heel rod of the trigger unit. Allow some six to eight inches of freedom and drill a small hole in the heel rod, making it just large enough to accept a small nail.

Several nail sizes should be tried. The optimum size is a nail barely large enough to hold the complete trigger when the cap is suspended with the complete unit hanging from it. (NOTE: This should *NOT* be tried atop the receiver pipe!) Once such a nail has been found we are ready for final assembly. The TNT or gunpowder is flaked and placed on a small tray . . . ideally a coffee grounds holder from a small percolater. The flakes or powder should be carefully tamped into place and either one or two electric primers inserted. This is placed around the heel rod with a pair of firing wires running up from the primers to the outside of the unit. The whole assembly is now screwed on and your A-bomb is complete. The wires are attached to a timer switch and the lower safety pins are removed. You now have some twelve hours to leave town before the town leaves.

When the timer detonates, the charge there is far more than enough force to sheer the retaining pin and drop the trigger down onto the receiver. Completely ignoring the acceleration imparted by the powder explosion, a free fall of twenty feet by a mass of ninety-five pounds will generate around 8×10^{10} erg/sec of kinetic energy at the point of impact. Added to this is the thrust of the powder charge. The total kinetic force should work out to something on the order of 10^{12} erg/sec; which is fully adequate to keep the two hemispheres in contact long enough to provide a thoroughly satisfactory bang.

The system is simplicity itself!

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But in fairness to all concerned we ought to mention a few minor problems which should be considered by anybody wishing to put one together. For example, we touched briefly on the flammability of uranium when we mentioned the acetylene torch. We should point out that *any* machining should be performed under a 'milk' bath. 'Milk,' for those not knowledgeable of machining techniques, is a milky appearing substance having many of the properties of oil but lacking its flammability. It is readily obtainable from any distributor of machine shop supplies with no questions asked. Use of this 'milk' will tend to minimize risk.

Actually, it would be better if the uranium were melted and machined in a pure nitrogen atmosphere, but with care and a bit of luck you will most likely be able to manage without going to any such extremes.

The radiation problems are a bit more difficult to handle. U-235 has certain *expotentiation* characteristics which cannot be ignored. Assume for a moment that one gram of radium has a characteristic radiation constant equal to χ. Two grams of radium would then have a radiation constant of 2χ. Three grams would equal 3χ, and so on. With either U-235 or plutonium this is not the case. It is this precise characteristic which makes them explosive while radium is not. While one gram of U-235 may have a radiation constant of 1χ, two grams might turn out to have a constant of 2.5χ and three grams could well top 6χ, etc. This can be a problem.

Since each of your hemispheres are in excess of half the critical mass they are *HOT!* Simply staying in the same room with one of these units for more than a few minutes is apt to be highly lethal. Inhaling air containing dust motes made radioactive by the U-235 is a reasonably quick way of saying goodbye to the world. For these reasons we would suggest some independent air supply for those working around the material. Possibly scuba gear could be used to solve the breathing problem. Solving the general radiation problem is a trifle more difficult, but with a bit of determination, some ingenuity and some luck it should be achievable.

We would suggest something on the order of a lead-encased, powered 'wheelchair' which can be moved around the room with the operator sitting securely inside. A small slit, covered with leaded glass, provides the needed visibility. Leaded sleeves and gauntlets will permit the operator to perform any needed mechanical actions involving the U-235 providing he is cautious and spends no more than a few minutes at a time working with the material. As an added security against stray radiation we would also suggest the laboratory be lead sheathed on both walls and floors. The basement ceiling should also be shielded with lead to avoid problems with the radiation from the receiver element. In all, probably about six to eight tons of lead would have to be used if even a minimal security is to be

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maintained. Since such a weight would have to be fairly concentrated it would probably also be necessary to shore up the flooring so the building doesn't collapse.

Once these precautions are taken, however, you should be well prepared to go about building your bomb.

There is still one more problem though; an old recipe for rabbit stew begins with the practical injunction "first catch your rabbit." Similarly, if you are going to build an A-bomb you had better get your U-235 or your plutonium. Since plutonium is a bit more difficult to lay hands on than U-235, we will begin by assuming you want to take the easiest approach and will concentrate on U-235.

In this your task may have been made far simpler since any number of newspapers and other scientific commentators have repeatedly pointed out that the best available source of U-235 is the local nuclear power reactor. By now there are nearly a hundred of these scattered around the nation so all that's necessary is to go in and steal a few of the control rods, smelt them down, purify them to eliminate the nonexplosive U-238 and then build your bomb.

Getting into the reactor complex is probably reasonably easy. Most campuses are only moderately guarded. Usually there is a cyclone fence of some sort and one or two security guards at the gate. It might be advisable to do a bit of discreet checking in advance to determine whether or not there are electronic guard devices around the grounds, but usually this is not the case. Under ordinary circumstances there is no point in trying to come in by the back way anyhow. Uranium has a rather considerable mass and no one person, nor even a group of several people, are apt to be able to carry out enough uranium reactor slugs to make much of a difference . . . particularly since they would have to be wearing protective armor to minimize the radiation hazards.

As we see it the best approach is the most direct. Simply steal a truck and semi-trailer and drive right up to the gate. Take out the guards, leave a couple of your own people as substitutes and drive right up to the reactor building, remove what you wish and depart. Very simple, very direct and highly effective.

But there are a few minor problems here too. The actual reactor itself is cased in a nickle-iron sphere which is immersed in a water coolant/moderator. Since every reactor has crane hoists and servo-mechanisms for use in working on the reactor during maintenance periods at least a part of the problem is already solved. These can be used to pick up the reactor core and slide it over onto a powered dolly which can then load it onto the truck.

One note of caution here; if you merely hoist the reactor sphere without pulling a few of the reactor slugs or inserting the appropriate dampers it will not be possible for you to load the device onto your truck. You will be dead in a minute or two and the whole

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reactor will be a puddle on the floor. For this reason we would suggest you take a prisoner or two and have them instruct you in the proper technique for pulling the core and removing the reactor unit.

Additionally, it would be wise to have your semi-trailer specially modified before you ever take it in. Total weight of the system being removed is somewhere in the vicinity of fifty tons, and since you would have to have at least six inches of lead shielding inside the trailer to protect the driver in the cab, the total cargo weight would gross out at about sixty-five tons. The need for additional support members in the trailer is obvious.

Alternatively, if removal of the whole core unit seems impractical, and if the power plant has enough spare slugs available, you might simply remove about 1,200 pounds of reserve slugs and load them onto the truck. This is quite a bit easier, but you cannot neglect to carry along enough moderating material . . . either graphite or lead . . . to prevent the slugs from building up heat and melting through the bottom of the truck. It would be embarrassing if you got all the way home and then discovered the bottom had melted out of the truck and the contents were scattered in a radioactive straight line all the way to your hideout. Since you would probably already be dying of radioactive poisoning by now there is little the police could do to make things worse . . . but it would still be an ultimate humiliation. So grab the 1,200 pounds of spare slugs and mix them with about 15,000 pounds of graphite and lead. This way you should get home safely.

Assuming now that you have gotten home and are not already incapacitated by the onset of radiation sickness, your next task is to set about converting the uranium slugs into A-bomb material.

Nuclear power reactor slugs are *enriched* with U-235. Natural uranium consists of some 99.5% U-238 and some 0.5% U-235. When prepared for use in a reactor the U-238 is mixed with enough U-235 to bring the U-235 fraction up to about 3%. This is a very considerable improvement, but it is not even approximately good enough to give you a bomb. Bomb grade uranium *must* consist of at least 97+% U-235, otherwise it simply *cannot* explode. It will get hot at 3%. If enough of the 3%-mix is piled in one spot it will boil away merrily and ultimately blow itself around the room, but there is no way it can give you a genuine A-bomb. To get one of those you have to refine the U-235 out of the mix.

The 1,200 pounds of enriched slugs you acquired can be expected to provide you with the needed thirty-six pounds of U-235, providing you have the time, the patience and the expertise to separate it all out. Should you have any doubts of your ability to perform a total separation you should plan in advance to increase the number of slugs removed from the power plant accordingly. If you feel you can

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obtain something on the order to 50% efficiency you might figure on picking up 2,400 pounds. If you are more pessimistic you might plan on 33% and grab 3,600.

Generally, with the best current techniques and several passes of the material, a refining efficiency of 25% is easily achievable. To go above that requires materials and equipment not apt to be available. This would suggest you ought to abduct a minimum of 4,800 pounds, with 9,600 pounds being an optimum target. Together with the shielding necessary to transport all this mass of uranium with a degree of safety you should figure on a total mass on the order of 150,000 pounds, or seventy-five tons.

Presuming this has been taken care of and you now have secure possession of approximately five tons of uranium slugs, you next have the problem of finding some place (or places) to store them while you set about extracting the needed U-235. For this we suggest you rent a small warehouse and move your operation there. You may keep your two-storey building as your ground-zero site, but it is showing signs of being a trifle impractical as a refinery, particularly in view of the difficulty of separating the two isotopes of uranium. As a good estimate, you should probably figure on acquiring a structure containing a minimum of 20,000 square feet of floor space if you are serious about going into the uranium refining business. It is simply too difficult to cram the needed equipment into any smaller space. After all, if it takes hundreds of acres to refine out U-235 at such places as Oak Ridge or Hanford, we hardly feel we are out of line in settling for a scant 20,000 square feet here. You will be cramped but it should be possible.

Now that you have your floor space you have to decide which technique you are going to use to separate out the U-235. Several of these are now available, but they tend to be mutually exclusive so you must pick one at the beginning and stick with it throughout.

As a terrorist one of the best methods for your purposes is the gaseous diffusion approach. This was the one used for the earliest A-bombs, and in many respects it is the most reliable and requires the least sophisticated technology. It is, however, a bit expensive and does require certain chemicals apt to raise a few eyebrows. You have to start with something on the order of a dozen miles of special glass-lined steel tubing and about sixty tons of hydroflouric acid which can be employed to create the compound *uranium-hexaflouride*. Once your uranium has been converted into hexaflouride it can be blown up against a number of special low-porosity membranes. The molecules of uranium hexaflouride which contain an atom of U-238 are somewhat heavier than those containing an atom of U-235. As the gas is blown across the membranes more of the heavier molecules are trapped than the light ones. The area on the other side of the membrane is

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thus further enriched with the U-235 containing material; possibly by as much as ½% per pass. Repeat this enough times and you wind up with uranium hexaflouride containing virtually 100% core atoms of U-235. You then separate the flourine from the uranium and arrive at a nice little pile of domesticated U-235. From there its all downhill.

Since hydroflouric acid is expensive and probably difficult to obtain without somebody asking the wrong sort of questions it would be best to steal it if you are genuinely determined on this method . . . either that or first steal a few million dollars first, then set up your plant as cover and not bother getting the uranium until you are ready to start the final phase of your operations.

Alternatively, if you decide the gaseous diffusion method is too cumbersome, you might merely construct a breeder-reactor pile somewhere out in the woods and use the enriched uranium to create plutonium. The plutonium could then be separated out by purely chemical techniques, thereby avoiding all the difficulties implicit in the gaseous approach.

Setting up a breeder pile is simplicity itself, and any of a dozen easily obtained college texts will spell out equally good methods so there is no need to go into them here. Suffice it to say there are not theoretical problems in putting a breeder reactor together. There may be a few practical problems . . . but if you happen to have access to a small, private river, a few train car loads of sodium, a considerable quantity of stainless steel tubing and about a hundred acres of secluded land you should be able to manage it nicely.

There might be a few problems in maintaining secrecy from low flying aircraft carrying radiation detectors, but if your building is properly shielded there shouldn't be too much of a problem and you might very well escape detection altogether.

Should neither of these approaches appeal to you, you might consider trying your hand at some for the interesting new techniques for isolating U-235 out of a conventional mix. One of these, for example, *starts* with a requirement for a cryogenic magnet capable of sustaining a 20,000 gauss flux inside a liquid helium bath. From there it starts getting complicated. A simpler approach utilizes a laser separation technique. U-235, being lighter in mass than U-238, departs with a slightly different vector when excited by a laser beam. You spray a thin mist of uranium atoms at right angles through a laser beam. The U-235 is driven out at a somewhat steeper angle than the U-238 so the task is fairly simple.

In principle it is easy and reliable. It is, however, a bit slow. Using any readily obtainable laser you could probably process as much as twenty pounds of uranium per day with a 12.5% efficiency. The resulting mix at the U-235 end, would probably run about 10% U-235 after the first pass, so a total of nine separate runs would be needed if the material is to reach

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bomb grade. Assuming you started with 9,600 pounds of slugs you should be able too come up with the needed thirty-six pounds of 97+% pure U-235 in just under four years.

This would be something of a problem in its own right. Almost certainly you would have picked up a lethal dose of radiation during the initial theft and transfer phases of the operation, so you would not *have* four years to complete the refinement. On this basis it would probably be wise to have at least one, and preferably two or three back-up crews of volunteers to replace you and your original crew as you die off. You will not live to see the end of your project, but with a little bit of luck . . . and no curiosity on the part of any of your neighbors . . . your successors should be able to create a pretty fair bang before they too die of radiation poisoning.

Should you anticipate serious difficulty in finding enough volunteers to carry through a long range project of this sort you might consider a few other alternatives. One of the more attractive, darkly hinted at by Ralph Nader and other such reliable sources, is considerably more direct. Rather than raiding the reactor plant and stealing the uranium, why not merely short-circuit the safety systems so the station itself goes up . . . taking a few square miles, plus you, along with it . . . or at least poisoning the neighborhood with some thoroughly nasty radiation?

This is a good idea. We recommend it, both for the directness of approach and the simplicity. Why go through all the bother of acquiring and refining tons of reactor-grade uranium just to get a few pounds of bomb-grade U-235?

Of course there is the fact that it is *only* reactor-grade stuff, which means there is no possible way for you to get an explosion out of the thing. That is simply impossible no matter what you do. But this does not mean you could not come up with a distinctly impressive melt-down which will release all sorts of radioactivity in the neighborhood.

Should you decide on this you will have to make definitive advance plans and work with split second timing, otherwise you are apt to discover all your efforts have gone for naught. The basic problem here is that most of the data concerning nuclear reactors comes either from newspaper reporters or Ralph Nader, and as such they ought to be accepted uncritically or not at all.

As we mentioned earlier, the core unit of a reactor consists of uranium slugs and moderators in a stainless steel sphere. As the moderator rods are slipped out of the reactor the neutrons released by decaying U-238 and U-235 atoms are captured by other atoms, triggering fissions there too. The trouble is, the process is relatively slow since the U-238 atoms are reasonably stable. The result is the sort of a chain reaction which cannot complete a real explosion. All it can do is build up heat and expand somewhat so the space between atoms serves as

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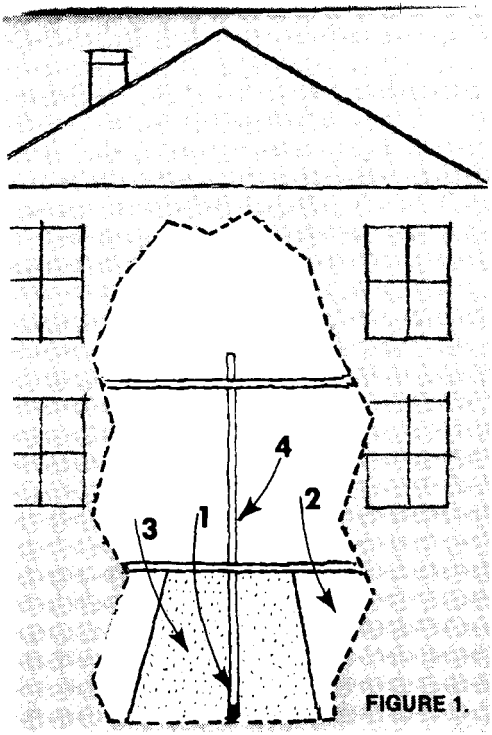

FIGURE 1.

1. **U-235 hemisphere at receiver**
2. **Bulwark or retaining wall to hold concrete**
3. **Concrete filler to confine explosion**
4. **Upper element of receiver, with trigger to be located at top.**

its own moderator.

The reactor itself produces power essentially as a steam generator. The heat of the core is used to create superheated steam which in turn drives turbines. To prevent overheating the core is placed in a special sink which floods automatically whenever the temperature starts to exceed a critical level. As there are also automatic moderator control rods and equally automatic fuel-slug removal devices this water flooding system seldom requires any sort of attention. It is merely a third level back-up in case the first two fail. In order to force a meltdown, therefore, it is necessary to override the automatic slug removal system, the automatic moderator system and the flooding system. Once this is done the meltdown goes to completion.

Now comes the question of specific goals in mind. Are you, as a terrorist, primarily interested in causing maximum amount of immediate dislocation in society? Are you rather more interested in knocking a nuclear power plant out of operation for some indefinite period of time? Is your concern with proving a point . . . say that you don't like nuclear power and that you wish to convince everyone it is simply too dangerous to play with?

Assuming you are mainly interested in causing a maximum immediate dislocation, it would probably be easier and simpler just to dynamite a few hundred high-tension power lines coming into New York City. Two dozen, strategically placed conventional small bombs would probably black out everything from Washington, D.C. north. A day or two would be required to mend matters and by that time you could be ready to blast some more.

This would be genuinely effective! It could seriously inconvenience thirty-five million people for a whole summer if done properly. On the other hand, if a solitary nuclear plant were disrupted there is a good likelihood no one would even notice. Power from other sources would automatically be fed into the grid and things would go

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on much as before. A few months later, say in the middle of winter, there might be a shortage of power to some industrial plants, but the overall direct effect would be negligible.

If your purpose is limited to K.O. the power plant for an indefinite period, then by all means tackle the main place. When the newspapers catch up with the story the nation will be deluged with panic headlines about the "narrowly averted" tragedy so the resulting publicity will be highly rewarding to your successors in the movement. Apart from the fear generated about all it will do is prompt the authorities to take addtional precautions to make it more difficult for the next group to break in. Since terror works best when it becomes cumulative this would appear to be a bit self-defeating. A persistent blasting of high-tension lines would be more effective in the long run.

So we assume your concern is proving a point. You want to demonstrate conclusively that nuclear power cannot be permitted in America. You wish to generate so much fear and horror that every plant will be closed down and the nation will rise up in arms against the "Atomic Monster." You wish to knock out a nuclear power plant and do it in the most deadly manner possible; releasing clouds of radioactivity over the neighborhood and killing as many people as you possibly can.

This is something entirely different from a mere disruption of the plant and an uncomplicated core meltdown.

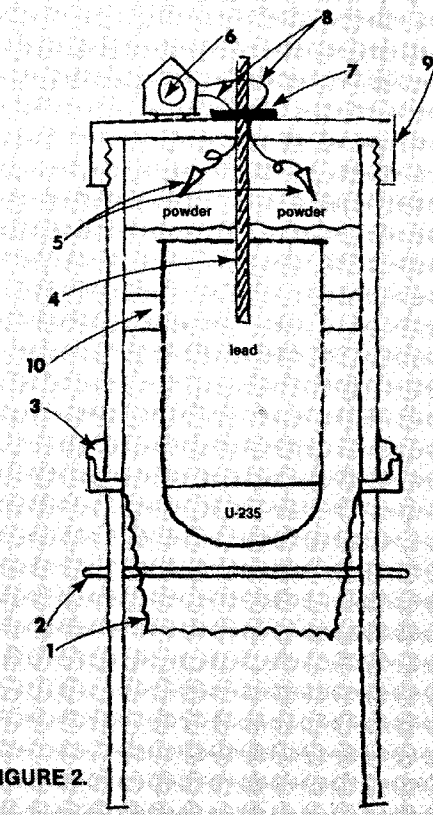

FIGURE 2.

1. **Wire safety screen**
   (Lipped under the trigger tube)
2. **Safety pin**
   (must be removed prior to firing)
3. **Acetylene weld**
4. **Threaded tailpiece**
   (screwed into lead and
   brought through hole drilled in cap
5. **Detonators**
6. **Timer**
   (with wires connected to detonators)
7. **Retaining pin**
   to hold lead uranium slug
8. **Wires**
   from detonators to timer
9. **Screw-on cap**
10. **Asbestos wadding**
    to prevent powder blow-by and increase pressure at instant of firing.
    The open space along sides is to allow air to escape around edges and prevent air pressure build-up as firing element is shot down the tube.

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To explain, suppose you simply pull all the safety systems and let the thing take off on its own. Temperature inside the steel core immediately starts building up. Within three or four minutes the steel around the core turns a cherry red, then becomes white hot. In another minute it would commence deforming and flowing as the melting point of steel was reached. Within minutes it would be a bubbling puddle on the floor of the reactor chamber. Mostly the puddle would consist of iron, nickle, chromium, U-238, U-235, graphite and some odds and ends of other elements, including minute quantities of plutonium plus fission end-products.

Still the heat continues to build until the uranium starts vaporizing as a high density 'steam'. As each atom of uranium is flung outward the distance between it and each other atom of uranium naturally increases. And with the increased distance the probability of neutron capture decreases. This cools the mass and reduces the temperature.

In general, the distance factor for the radioactive material can be calculated to a good degree of precision. We assume a vaporization temperature for uranium at around 4,500° F. We also assume the sphere was formed from Durimet B, which consists of: 48% iron, 35% nickle, 12% chromium, 5% silicon and a trace of carbon. The melting point of Durimet B is right at 4,950% F. These two factors, when combined, provide for an understanding of the meltdown physics. Since the sphere containing the fission material melts at a higher temperature then the contents, once the safeguards have been disrupted the core rapidly becomes molten. The heat continues building up until the outer sphere melts, releasing the core material. Once the core material has escaped, however, the metal of the sphere quickly solidifies. But since it is lighter than the uranium it forms a crust atop the still molten fission material. This gives us three different areas to consider, the molten substrate which consists of uranium, the surface crust consisting of iron, nickle and chromium, and the diffused uranium which escaped as a vapor before the crust formed. Somewhere in this mix there are also a number of fission byproducts, but for the most part they can be neglected.

The uranium trapped beneath the solidified container metals will remain extremely hot until it is broken up and separated so it can cool. A surface temperature in the vicinity of 3,000° F is a reasonably good estimate. But so far as radiation hazards are concerned there is not much to worry about. The region immediately around the reactor room will remain unusable for a year or so while automated machinery picks up the pieces and takes them out for refining, but it is not going to hurt anyone outside. Only that portion of the radioactive material which escapes the reactor complex and gets out into the surrounding countryside is going to be able to cause casualties. And with a conventional meltdown most of

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the material which could escape is going to be buried under the solidifying nickle-iron-chromium jacket. Only if you can get the uranium on the *outside* of the jacket, so it vaporizes and escapes first, will you be able to do much.

Since we presume you want to release as much radioactivity as possible, this means you must also take some secondary steps. One of these might be to break into one nuclear power plant and steal as many fuel rods as you can. Then bring them over to a second plant and place them around the core before starting the meltdown. This would be effective and you could die happy in the knowledge your martyrdom probably killed fifty or sixty people in the hundred or so acres downwind of the complex. A second, and even more effective plan, would be to break into some military installation and simply steal one of their A-bombs. Bring this into the power station and you find you have achieved a geniune bang.

Of course, if you've broken into the military installation and already have your own A-bomb then there is really very little reason to go through all the other rigamarole with the power station to begin with. Just take your little treasure, figure out how the trigger operates, and set it off.

Alternatively, if you find it too difficult to obtain an A-bomb from the U.S. military, you might try to contact the Palestine Liberation Organization, the Red Brigades in Italy or the Provisional Irish Republican Army in Belfast. These are all well-financed, well-organized groups which have been in existence for years. Since we have shown how simple it is for you to build your own A-bomb then rather obviously they must have a few dozen of their own stashed away in the woods somewhere. And since they are not using them surely they would be willing to offer you one or two in a good cause.

Should they prove to be selfish about the whole thing and pretend they have none of their own then you will either have to fall back on one of the alternatives I have suggested here or set about creating a terror weapon which does not involve nuclear weaponry.

In this regard may I suggest biological warfare. Several years ago the United States discontinued its research in germ warfare and presumedly dumped its supplies. Since it is necessary to perform enough research to know what sort of plagues you can manufacture before you can discover how to stop the plagues someone else manufactures then there is every likelihood the nation would be virtually defenceless against a first-class biological attack.

Spray a little anthrax bacillus in the air-conditioning system of the U.N. building, for instance, and within a week or so people will be dropping like flies. Let a few thousand people die in an artificial plague of this sort and the panic would easily match that of an A-bomb . . . And it would certainly be a lot easier to make. ■

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THE REUNION

Scientists strive to keep their personal feelings out of their work, do they?

PAUL J. NAHIN

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Dr. Richard C. Breed walked briskly across the campus parking lot to his car. He casually greeted two of his women students, and glowed inwardly at their open admiration of his carefully nurtured, sophisticated professorial image. Teaching the college service course in geology had its benefits.

He *did* cut quite a figure, dressed in fifty-five dollar wing-tips, immaculately tailored vested tweeds, and corduroy hat with a jaunty red feather stuck in the brim. The silk tie, silver cuff links, and five hundred dollar pocket watch with gold chain completed the picture. He puffed with pleasure on his two hundred dollar Danish briar pipe, leaving the fragrant, faintly vanilla flavor of "Captain Black" in his wake. The women loved it, and with his rugged red beard, he liked to imagine himself a scholarly Viking.

Richard Breed had it made. A scientific entrepreneur who regularly had his $100,000 a year NSF geological research grant renewed. He didn't do much original field work himself now, busy as he was recruiting new doctoral students to do it for him, and hustling foundation money to pay them. Not to mention that nice summer salary of two-ninths of his fat academic year pay. Oh, once in awhile he might chip rocks at a local site, but reading seismological charts in his office fitted his schedule better.

Yes sir, he had come a long way from the fat, pimply teenager with bad breath in the small Southern California high school of almost a quarter century ago. He frowned as he thought of those long ago schoolmates that he had once envied, and hated. Young, and arrogant with their supposed immortality, they had never let him belong. He had been the outcast, the one made to feel like something peculiar, almost repugnant. While the others had greeted each other loudly in the halls, gone to dances together, and generally gloried in the golden days of teenage youth, he had spent those same years as a lonely recluse in the library with his science and math books. Called 'four-eyes' and 'specs' until the words made him ill, he had finally started to come out of his shell late in his senior year, when he won a national math contest. But it was too late to make any real difference then.

Even now, as a forty-one-year-old late bloomer who had certainly bloomed well, his physiological reaction to recalling those four years of pain was a blush of shame and embarrassment at the klutz he had been. And an almost overwhelming flood of hate at those who had made him so miserable.

"Ah, if only those bastards could see me now. The ones that didn't become mothers at eighteen, or criminals, are probably eight-to-five slaves or beer paunchy firemen. If only I could see *them* now, it would be so very, very different!" The thought ran sweetly through his mind, and he enjoyed the imagined pleasure of what he knew would be their envious reaction to the new, soon to be famous Richard Breed.

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He reached his car and carefully placed his bulging briefcase on the back seat. Stuffed with lecture notes and color slides for next week's International Seismological Conference in Montreal, he planned to study them one more time over the weekend. He was absolutely sure of his calculations, but what he was about to reveal was such a shocker he knew the questions would come hard and fast. He had to be overpowering with his rebuttals.

After Montreal, election to the National Academy was certain. The Nobel Prize in Physics would surely soon after be his. With a change in Administration, he could even imagine the post of Presidential Science Advisor being offered. And maybe he'd take it, and maybe he wouldn't!

Once home, after checking the box for mail, he locked the conference papers in his desk to await a careful restudy later that evening. Tossing the handful of that day's letters on his desk, he went into the kitchen and mixed himself a Bloody Mary. As he sipped his drink while walking back to the study, he let his thoughts run on over the pandemonium he knew would result at the bomb soon to be set off in Montreal.

After years of painstaking data gathering and several extensions of Carson's dissertation ("I get the Nobel and all he gets is a PhD and an assistant professorship, but that's the name of the game!"), Breed had formulated a mathematical prediction theory for earthquakes. His test calculations over the past three years had all been on the mark in location, time, and intensity. But telling people you had privately predicted quakes that had already happened wouldn't cut any water. He had to put his butt on the line, in public, with a major prediction.

The new strain gauge data from Caltech's monitoring stations along the San Andreas fault had given him what he needed. On the morning of June 14 of next year, there was going to be an 8.3 shake with its epicenter forty miles south of Los Angeles. Breed chuckled to himself as he thought how close that was to the old high school. Mother Nature was going to do what he had wanted to, so many years ago.

What was really going to cause trouble wasn't just that damn near all of Orange County was going to get flattened. If they didn't listen to him, it was also going to explode! Right in the middle of the target area, next to the sleepy little town of his youth, was a vast underground storage facility of liquified natural gas. Used as a depository by several of the oil giants, the town was literally floating on a lake of LNG. The entire county would have to be evacuated, and the tanks drained. The cost would be horrendous. Breed figured they'd evacuate people, all right, but would take a chance on leaving the tanks full. What a show that would be! Weather satellite imagery of the detonations would be the lead story on the evening news, worldwide.

He began to thumb through the

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mail on the desk as he finished his drink. All the usual crap was there—electric bill, a reminder to stop in at the bank and have his credit card photo updated, and his subscription copy of *Time*, only three days after it had already hit the stands. Then his eyes caught a familiar address on a stapled flyer and he held his breath as he unfolded it.

MEMBERS OF THE CLASS OF 1958

Thanks for your great response to our previous announcement of the plans for our TWENTY-FIFTH REUNION next year! Can you believe it's been almost a quarter-century since we last walked the halls of high school together? We can't either! But we still haven't heard from everyone! Out of 93 announcements, we got 82 replies. If you are one of the missing eleven listed below, or know how to reach someone on the list, please let us know. The reunion dinner and dance will be the evening of June 13, and the next morning, too! The place, of course, will be the high school gym. Singles are $12.50, couples $20.00, for dinner, drinks and dancing.

Looking forward to seeing you,
CLASS OF '58 REUNION COMMITTEE
David Whiply
Tim White
Mary (Mason) White

Breed was stunned for a moment, as he saw his name among those of the missing eleven. Christ, he *would* be able to put those SOBs in their place! But what was all this business about a prior announcement? He hadn't seen it or heard anything.

Ah!, now he knew what must have happened. For two months earlier in the year he had been abroad. He had instructed his secretary to forward only the obviously important stuff, and to hold everything else. The first announcement must have gotten lost in the pile of local junk mail and campus event notices.

Breed's eyes wandered over the sheet again, and stopped at the names of the reunion committee. Wouldn't you know it—the three biggest creeps in a class of creeps. Memories came back in a wave of pain.

It was a cold, windy day, and the third period gym class had just suited up. The boys were on one side of the football field, and the girls on the other, all lined up for roll-call. As usual, fatso Dick Breed felt awkward and out of place in gym shorts (number 64) and T-shirt. A flaming redhead, he didn't tan, and his skin was pasty white. The green shorts looked like a bacteria mold growing on his bread dough body. He had been late to class, and as he stripped and dressed hurriedly while thinking about next period's trig exam, Breed had failed to notice his shorts were on backwards.

But that primitive Neanderthal, Dave Whiply, noticed. "Hey, Four-Eyes! Does that 64 across your butt stand for its weight or its size?" The girls heard it, too, and even the gym teachers grinned. The entire class laughed, and Breed could have died

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with shame. The rest of the period passed in a horrible, slow crawl, all the while that damn number burned itself into his backside.

The Senior Prom was all that everyone had been talking about the last three weeks. Dick Breed had been walking around with butterflies in his stomach for days, especially in English IV, where he sat behind Mary Mason. Time and again, he had almost worked up enough courage to ask her to go with him, and then something had happened to ruin the moment. But today he promised himself he would ask. Time was running out. Mary came into the classroom with a group of giggling friends, and Breed braced himself. As she sat down in front of him, and before she could start talking to anyone else, he leaned forward and spoke in a not-quite-a-whisper voice. "Uh, Mary, I was, uh, sort of wondering, that is if you don't have anything else planned, if you'd like to go to the Prom dance? With me, I mean!"

For a terrible, sick moment, Breed thought she was going to just ignore him. Later, he wished she had. Mary turned slowly in her chair until she almost, but not quite, faced Breed.

"Dick Breed, you little frog! How dare you ask me that, right here in front of my friends!" Mary was hissing the words out in a tight, hushed voice. Her face was distorted with rage, and Breed was actually scared. The students around them began to notice the exchange, and Breed tried to shrink through the seat of his chair. "I'm going to the Prom with Tim White, and if he found out about this he'd take care of you, but good! So you just keep away from me!"

That night, for the first time since he was a little boy, Breed cried himself to sleep.

Breed was sitting alone in a corner of the cafeteria, eating that day's cruddy, mass produced meal of greasy taco, reburned beans, salad turned brown at the edges, and warm lemonade. He scarfed it up with the indiscriminating appetite of the teenage overeater.

He could hear all the other kids at the nearby tables yelling in good-natured cheer. Nobody talked to Breed. Suddenly he heard his name called. "Hey Dick—Dick, over here!"

The concern for ***man*** *and his* ***destiny*** *must always be the chief interest of all technical effort. Never forget it among your diagrams and equations.*

ALBERT EINSTEIN

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Breed looked up from his tray in surprise, and saw Tim White waving an arm at him. Big, tall, handsome Tim White, who had taken Mary to the Prom.

"Hey Dick, Jack Preston tells me you're pretty good with your hands in machine shop. Is that true?"

Breed couldn't believe his ears. Maybe this was the key to getting to be friends! He'd helped Preston chuck a piece of tubing in a lath last week in second period shop, and the word must be getting around that fatso Breed wasn't a total creep.

"Uh, yes, I guess I'm okay working with tools. You know I'm not great or anything like that, but I do all right. I suppose." He saw a little smile on Tim's mouth, and that worried Breed. Was this just another damn trick?

"Well, I'll tell you, Dick, I was wondering if you wanted to come with us on a deep-sea fishing trip next weekend. My dad's renting a boat at Newport and we sure could use a good man with his hands, like you." White spread his arms wide to indicate the group of grinning boys and girls sitting at his table as the fishing party. Breed's suspicions evaporated. Tim *was* just being friendly!

"Gosh, that sounds like fun, Tim. Is there anything special I could do to help out on the trip?"

"You bet, Dick! A guy like you, really good with his hands—well, while we got the lines ready with hooks, you'd be our—Master Baiter!" White collapsed in hysterical laughter, and his gaggle of friends hooted at Breed who, burning with shame, ran from the room.

Professor Richard C. Breed, PhD, sat motionless for a long time, his right hand wrapped around the Bloody Mary in a sweaty grip. Being a sturdy tumbler made to hold a stiff triple shot of whisky was all that kept it from snapping.

Finally, he picked up the telephone and dialed. He could hear the long distance switch gear rattle on the circuits like electronic crickets. Then the sharp, clear ringing of a telephone a thousand miles away.

"Hi, Pete, this is Dick Breed. Yeah, I'm fine, but look, I've got some late-breaking plans. I'm not going to be able to make it to Montreal. I've just turned up some problems in my data—no, no problems in the theory. Just some technical details in my computer runs, but I'd like to have it just right before I present it publicly. As conference chairman, I hope you can fill in my scheduled slot and give my regrets to the others. Okay?"

"Hey, great Pete. I appreciate it. I'll try to get my stuff cleaned up for the go around in England next year. Yeah, I'd like to spend the Christmas holidays in London, and that'll be a good reason. Thanks for covering for me, Pete. My best to Betty. So long."

Breed hung the receiver up and stared at the reunion notice, and then crumpled it in his hand and flung it into the trash bucket. "Eat, drink, and be merry, you bastards. I'll be watching for you on the evening news." ■

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JEFFREY TERRESON

SHARE IT WITH ME

Human societies depend on voluntary cooperation by their members. But what if you want to cooperate—and can't?

KIRILL BULYCHEV

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How I long to go back, but I know it can never be. I know I'll be consumed by envy for the rest of my life.

At the time I suspected nothing. The elevator doors clicked and buzzed, and I walked down a steep ramp onto the spaceport's brightly colored walkway and paused, trying to determine who among the waiting crowd had been assigned to meet me—my hosts had been informed of my arrival well in advance.

The man who approached me was tall and wiry. His long fingers stained green from constant contact with herselium told me at once that he was my colleague.

"How was the flight?" he asked as our car passed through the spaceport's gates.

"Fine, thanks," I replied. "Uneventful."

Actually my words contained a polite lie: it had been a tiresome journey with layovers for connecting flights in uncomfortable stinking cargo ports; on top of everything else I had almost blacked out from the G forces which had absolutely no effect on passengers native to this section of the galaxy, and now I had a splitting headache.

My host didn't answer but only frowned as if he were suffering from a chronic toothache and anticipating the next wave of pain. Some three minutes passed before he spoke.

"I guess the G forces on our ship were pretty hard to take. You're probably not used to such an overload."

"No, I'm not."

"Do you have a headache?"

Seeing that the pain had struck him again, I didn't answer.

"Do you have a headache?" he repeated, then added almost apologetically: "Unfortunately, your ships rarely come this way."

It was only after the spaceport was several kilometers behind us that I felt myself in a foreign land. Until then I had seen only the spaceport, and if you've seen one, you've seen them all. Like all stations—train, plane, or astrodisk—they are uniformly impersonal and tasteless.

The further we rode, the more distinctive became our surroundings; here, outside the center of the city which had succumbed to the latest galactic fashions, everything had developed in its own unique way. Only minor details recalled what I had seen elsewhere. But, as usual, it was the minor details that caught the eye.

They were fascinating. I even forgot about the headache and nausea that had bothered me since I landed. My mood had improved, and the fresh, fragrant air flowing through the window promised a warm welcome.

At the edge of the city, amid low buildings surrounded by gardens, my companion slowed down.

"I hope you're feeling better," he said.

"Thanks, much better. I like your planet. Reading about a place or seeing pictures of it is no substitute for the real thing. You've got to experience colors, scents and distance to get a feeling for new surroundings."

"That's very true," he stated with a

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grimace. "By the way, you'll be staying at my house. You'll find it more comfortable than a hotel."

"Oh, no. I wouldn't want to put you to any trouble."

"It's no trouble at all."

The car turned into a driveway which skirted a steep hill. Seconds later we drove up to a two-story house set deep inside a garden.

"Wait for me here," said my companion. "I'll be back in a minute."

While I waited I studied the flowers and trees. I felt rather uncomfortable; I sensed that I had intruded, that my presence was superfluous.

A window on the second floor flew open and a slim young woman looked out. After looking me over briefly but attentively, she nodded in agreement to someone standing behind her. Then she moved away from the window.

Suddenly I felt at ease. Something in the girl's expression, in the way she opened the window, in her fleeting glance, banished into the depths of my consciousness the tribulations of my journey, the disappointment at my host's somewhat cool reception, and the disturbing prospect of having to live in a strange world two or three months before I could return home.

I was sure the girl would come downstairs to greet me, and my expectation was quickly realized. Suddenly she emerged from a mass of foliage.

"Hello there! Bored yet?" she asked, smiling.

"Not in the least. I'm in no hurry. And your garden is marvelous."

The girl was lightly dressed, and her movements were abrupt and awkward.

"My name is Lena. Come, I'll show you your room. Dad is awfully busy, with Grandma being so sick."

"Then you must excuse me for intruding. Your father didn't mention it. Look, I'll go to a hotel—"

"You'll do nothing of the sort," objected Lena. Her eyes were a strange color, like old silver. "You'd be miserable there with no one to look after you. Don't worry, you won't be in the way. Dad asked me to take care of you while he stays with Grandma."

I probably should have insisted on going to a hotel. But I was powerless: for some strange reason I felt that I had known Lena and this house and garden for a long, long time, that I belonged to the household. Every fiber of my being resisted any suggestion of abandoning it to live in a hotel's impersonal indifference.

"Well then, it's settled," said Lena. "Come on, we'll go inside."

Lena showed me the room where I would be staying and helped me unpack. Then she took me to the warm, bubbling swimming pool obscured by a dense arch of trees.

From there we went up to the roof to visit her noisy menagerie. It boasted striped talking grasshoppers, six-winged birds, tiny blue fish dozing in flowers, and the most ordinary terrestrial cat, that is, ordinary to me, but extremely rare to them. The cat ignored me. Lena was disappointed.

"I was sure she'd be delighted to see

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you. What a letdown!"

Lena stayed with me all day, and I hardly saw anyone but her. Every now and then she would excuse herself and run off. "You're probably terribly busy," I would say. "Please, don't pay any attention to me." But each time I was left by myself the loneliness and physical discomfort would return. I would wander over to the bookshelves, pull out a volume, and quickly put it back. Then I would go out to the garden and return to the house again, all the while listening carefully for her footsteps. Lena would come running, touch me lightly, and ask:

"Get bored?"

"A little," I would reply.

Once I even summoned up the courage to tell her that all my ailments vanished in her presence. Lena smiled; her brother, she said, would return by supper time with medicine to relieve my postflight distress.

"By morning you'll feel like new. All your symptoms will vanish."

"And you?"

"Me? What about me?"

"Will you vanish too? Like the Good Fairy?"

"Don't worry," said Lena firmly. "I'll still be here tomorrow."

At supper the entire family, except Grandma, gathered around a long table. I was surprised to learn that no fewer than ten people lived in this seemingly deserted house. The head of the household, pale and tired, sat next to me and saw to it that I downed all the medicine brought by his son, a medical student. It was miserable stuff, just what medicine is supposed to be, but I took it obediently; and I told no one that the only sure cure was Lena herself. Lena sympathized with my plight, frowning when I had to down a particularly bitter pill.

My host announced that his mother was feeling better, that she had fallen asleep. Despite his fatigue and pallor he talked and laughed a lot, presenting quite a contrast to the morose man who had met me at the spaceport. Then, he had been upset about his mother's condition. But now . . .

"She's awake," my host announced suddenly.

My ears perked up. I hadn't heard the slightest sound: neither a cough nor a sigh had broken the dead silence.

"You're tired, dad," said my host's son. "I'll go up to her."

"Nothing doing!" objected his father. "You have school tomorrow."

"What about you—don't you have to go to work?"

"All right. We'll go together," said his father. "Please excuse us."

After dinner Lena escorted me to my room.

"I hope you don't have trouble falling asleep," she said.

"I'm sure I won't, especially if one of those tablets was a sleeping pill."

"Of course one was," said Lena. "Good night. Sleep well."

Sure enough, I fell asleep immediately.

I woke up the next morning completely recovered. I hurried out to the garden, hoping to find Lena there. She

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was waiting for me by the pool. I was about to tell her how soundly I had slept, how delighted I was with the beautiful morning, and how pleased I was to see her, but I didn't get a chance to open my mouth.

"I'm so glad," she said as if she had read my thoughts. "Grandma's feeling better too. Dad will take you to the institute now. I'll be waiting for you this evening. I'm anxious to hear all about your work and what you've seen."

"Oh, I'm sure you'll be able to figure that out yourself."

"What do you mean?"

"You can read people's thoughts."

"That's not true!"

"I know I'm right. For example, you didn't even wait for me to tell you myself how I felt. And yesterday your father left the table because your grandmother woke up. Yet there wasn't a sound in the house. He couldn't have heard anything."

"It's still not true," insisted Lena. "Why should I read people's thoughts? Including yours."

"I suppose you wouldn't have any reason to do that." I was mildly disappointed by Lena's lack of interest in my flattering thoughts about her.

"Good morning," Lena's father greeted me as he stepped into the garden. "You're in fine shape today. I'm glad."

"You see, I'm right," I whispered to Lena before following her father to the car.

"Why would I have to read your thoughts?" she repeated. "Your face is an open book. It's all there."

"All?"

"Too much, I'd say."

Several days passed. I worked at the institute during the day; evenings were spent wandering about the city, hiking through fields and woods, or strolling along the shores of a large salt lake teeming with armor fish. Sometimes I went alone, sometimes with Lena. I grew accustomed to my hosts and met two or three other engineers. Yet, as ordinary as my daily existence was, the feeling never left me that the people around me were far from ordinary. I was almost convinced that they possessed telepathic abilities.

At times I felt uncomfortable with Lena because I caught myself thinking thoughts that I wouldn't want to share with her. It seemed as if she was hearing the soundless words and was laughing at me.

One day I was walking along a street, green and winding, like most of the city's streets. Ahead of me some boys were kicking a ball. As I walked behind them I struggled with an impulse to catch up and take a crack at it.

I didn't notice a protruding root; I tripped and fell, injuring my knee on a rock. The pain was so sudden and sharp that I let out a yell. As if struck by my shout, the kids stopped dead in their tracks. The ball rolled on, down a slope. Ignoring it, the kids turned to me. I tried to smile and wave them away. "Go on, boys, go chase your ball. It's nothing. It doesn't hurt a

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bit," I said. But they stood there and watched me.

I raised myself a little but couldn't get to my feet. It was clear that I had strained a ligament. The boys ran up to me. One, a little older than the others, asked: "Does it hurt a lot, mister?"

"No, not so much."

"I'll get a doctor," said another.

"Hurry!" said the older boy. "We'll wait here till you get back."

"Never mind, boys," I said. "It's nothing serious. Just a pulled ligament. I'll be OK in a few minutes."

"Of course you will," replied the older boy.

As if obeying a command, the pain subsided and then vanished. The boys stood there silently, watching me with concern. But the youngest suddenly burst into tears. The older boy told him to run home, which he did.

The doctor arrived. It turned out that he lived in the next building. He examined my leg, gave me a shot, and the kids disappeared immediately. Only the distant sound of a bouncing ball reminded me of their recent presence.

The doctor helped me back to the house, even though I kept insisting that I could make it on my own.

"The pain is gone, doctor. It hurt only the first minute or so. The kids can tell you that."

"Are you new here?" asked the doctor.

"Yes, I am."

"H'm, then it adds up."

Still I did not understand.

Although it was still early, the entire household had gathered. Grandmother had taken a turn for the worse and had to be rushed to the hospital for surgery.

I went over to Lena. Dark circles showed beneath her eyes and her face was pale and tense.

"Don't worry, everything will turn out all right," I said.

She didn't quite catch my words at first and glanced around with a puzzled expression.

"Everything will turn out all right," I repeated.

"Thanks. Oh, did you fall?"

"Nothing serious. It doesn't hurt anymore."

"Grandma is in terrible pain."

"Why don't they give her a shot? It worked for me right away."

"They can't. Nothing helps anymore."

"I'd like to do something to help."

"Then just go away for a while," she said gently, trying not to offend me. In an even, flat voice, as though she were asking for a glass of water. "You're in the way."

I went out to the garden. I tried to be understanding. After all, it was hard on her, and on the rest of the family.

I watched them leave. Alone now, I went upstairs to the menagerie. The cat recognized me, pattered over to the screening and rubbed up against it, curling its tail. Where I came from cats didn't live in cages, but here they were rare, exotic animals. I, too, was a rare animal who could neither under-

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stand what was happening nor could hope to understand. Yet I felt that a warm friendship had sprung up between my hosts and myself. At a most inappropriate time some sort of mysterious defect or gap in my make-up had surfaced. Utterly baffled, I realized that I would have to visit the hospital to find the answer. There I would learn something very important. Although I hadn't been invited, and most likely my presence would be undesirable, I felt compelled to go.

No one stopped me at the entrance. The girl at the desk asked if she could help me. I gave her Grandma's name and was escorted to the elevator.

I walked down a long corridor which didn't look as if it belonged in a hospital. Chairs jammed against each other lined the walls. People were sitting in them. Completely healthy people. Silently they were enduring great pain.

I saw my friends near the frosted glass door of the operating room. Lena, her father, her brothers. In adjoining chairs sat mutual friends, coworkers, and neighbors. Lena glanced at me. Her eyes, filled with pain, slid over my face.

I slipped into an empty chair. It was uncomfortable watching people so totally oblivious to my existence. But now I knew what had been a mystery to me only an hour ago.

I didn't have to wait very long. Suddenly, as if an invisible sorcerer had waved his hand over them, Grandma's visitors brightened and revived. Someone remarked: "She's under anesthesia now." Among themselves they arranged for some to remain and keep vigil and for others to return after the operation, when the anesthesia wore off.

Lena came over to me. I stood up.

"Please forgive me," she said. "I'm awfully sorry, but I'm sure you understand . . ."

"Of course I do. How can I be angry at a time like this? I'm just sorry I'm an outsider."

"Please don't be. It's certainly not your fault."

"You know, when I fell yesterday, kids came running over to me and stayed with me until the doctor arrived."

"That doesn't surprise me."

Her father jumped in.

"Thanks for coming," he said. "Take Lena with you. We'll manage here without her. The doctor assured me that the operation would be successful."

"I'm staying, dad," said Lena.

"Whatever you want."

"Please try to understand," said Lena after her father had gone. "It would have been very difficult to explain everything to you at the very beginning. It's as natural for us as eating, drinking and sleeping. Children are taught as soon as they come into the world."

"Has it always been this way?"

"No. We learned several generations ago. But the potential was always there. You probably have it, too, but buried somewhere deep in your brain. I'm sure any intelligent being would

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want to have the ability. Don't you think so?"

"Yes, I suppose you're right," I said. "If someone near you is suffering, especially if it's someone you love, you'd want to share the pain."

"Not only the pain," replied Lena. "The joy, too. Remember your first day, when you arrived? You felt awful. Dad could do little to help you. The main burden of Grandma's pain fell on his shoulders, as her son. Even when he met you at the spaceport, he had to help Grandma. The greater the distance between you and the person you're trying to help, the harder it is to help. You thought Dad was rude. Didn't you?"

"Well, not quite, but—"

"As if Grandma's misery wasn't enough, he had to take on yours, too. After all, you were our guest and you had a headache."

"An awful one, too."

"Sometimes I wonder how Dad made it home. As soon as he arrived he relieved me at Grandma's bedside. I saw you through the window and I liked you. So I stayed with you all day, and because of you I had a splitting headache all day."

"I'm sorry." I said. "I didn't know."

"It was better that way. Imagine how upset you would have been if you'd known."

"I would have left."

"I know. I'm glad you didn't. Please go home now. When I return in the morning I'll knock on your door. We'll finish talking about it then."

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Again I passed through the long hospital corridor where relatives and friends of the sick were sitting. They had come together to share the suffering. And it wasn't a question of mind-reading: people simply knew they needed each other.

I walked home. My leg ached a little but I tried to ignore the pain. At times it would flare up and threaten to overwhelm me. The pedestrians who passed closest to me glanced around and looked at me, and instantly I felt better. But I quickened my pace to avoid troubling these good people. On the way I encountered a group of young women carrying flowers. They were chattering and laughing. No sooner did they notice my glum expression, then they boosted my spirits

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with their radiance. A happiness not my own flowed through me. From an old man on a park bench I received another gift—serenity. These things had happened to me before, but I hadn't noticed the connection between my own and other people's feelings.

Life is both easier and harder for them than for us. They can give and receive joy and grief; rather, I should say, they *must* share their happiness and pain. It is impossible for them to turn away from their fellow men: where we see human tears, they feel them. And the heart is more sensitive than the eye.

That day I became an envious man. Yes, I envy them; at times I even feel something akin to hostility toward them. To them I'll always be an outsider, like a beggar among munificent rich men. I can receive gifts but am incapable of giving them.

The day arrived for my return to Earth. As prearranged, only Lena accompanied me to the spaceport.

"I'd like to go back with you," said Lena.

"You can't, and you know it. Life on Earth would be very hard on you. You couldn't share only my joy or my pain, could you?"

"You're right, I couldn't," agreed Lena. "It's a shame."

"And I couldn't live with you knowing that you were lonely and I couldn't help you when you needed it most."

"Then maybe you could stay with us? Here? With me?" A note of doubt crept into her voice.

"Do you remember the day your grandmother was operated on?" I said. "I went to the hospital, but I was like a blind man among the sighted. No, I can't stay."

Our conversation had been rehearsed for days. We were merely repeating our lines, knowing how it would end. But we couldn't help ourselves. We were hoping against hope for a compromise, for a way out of our dilemma, for anything that would keep us together.

When we reached the ramp, Lena drew so close to me that I could see the dark spots in her silvery eyes.

"Try to remember me as I am now," she said.

Overwhelmed by our emotions, I began to feel dizzy. I grabbed her arm for support. But not one of the passengers boarding the ship came to my assistance; not one attempted to share my anguish. Yes, there are times when the impulse to help another must be restrained.

Then came the lift-off, the G-forces, and the jolting, layovers for connecting flights in uncomfortable, stinking cargo ports, nights in impersonal hotels, lousy food at identical shiny counters, but mentally and physically I was in great shape. And I knew why. Millions of kilometers away Lena was sitting in her second-story bedroom, suffering from a splitting headache. I was angry at her. "Forget about me, my love. Leave me at least my pain."

How I want to go back, but I know it can never be. ■

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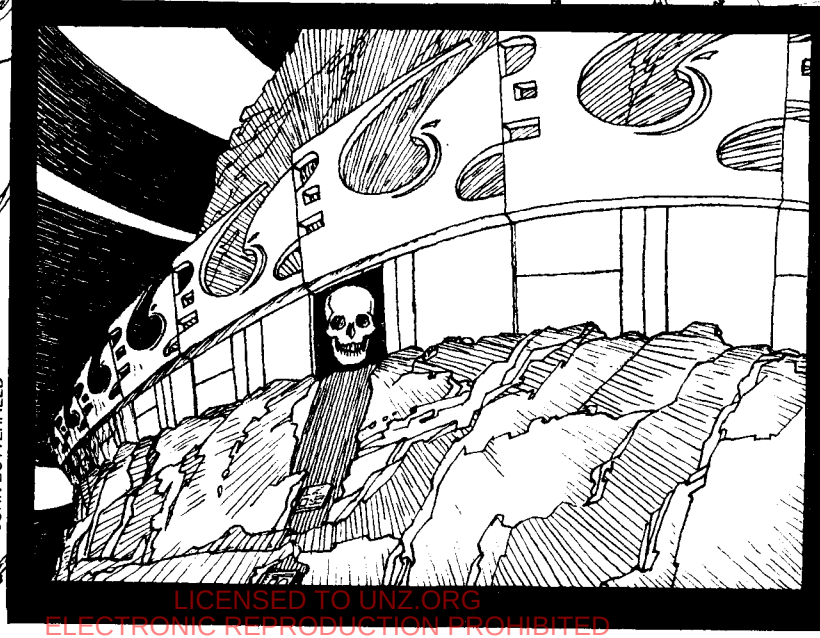
PATHWAY

Every great discovery is
a personal triumph.
Some are also personal tragedies.

EDWARD BYERS



JOHN BUTTERFIELD

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I was examining a section of friable, earthy stone when Rowan buzzed. Another tourist had arrived.

"The season is over," I said shortly. "Finished. *Ganz alles kaput.* The mountain is closed."

"I know that, sir. He will not go away."

I catalogued the stone before answering. I was in no mood for further interruptions. For eight months I was willing to play the fool, laving charm like butter from a crock. Enough was enough! The *melte* belonged to me.

"Tell him to come back in ninety days." Three months from now the mountain would again don its white shroud. I would emerge from my lab, forelock well in hand, china-stepping my way into the hearts and purses of the curious—the poets—the seekers after grails. But not now. Not with the contents of two plaques to unravel.

I heard mumbling over the intercom. Trying to get all that straight, I guessed.

"Yes, sir," Rowan said finally. The intercom went dead. After several minutes it buzzed again. Rowan's voice had graduated into a high squeak.

"Doctor Kirst—"

"What?"

"He insists upon talking with you."

I sighed and put aside my stylus. "'Once more into the breach,'" I said. "Okay, Ro. Tell our visitor I'll be up shortly."

I got a click as he cut me off.

To get from the laboratory to the lodge I had to go outside. As always, the mountains dominated everything, pocked with cancer now that the snow was rotting away. Its brown and black cliffs hung above the valley like crusts of blood. You'll pardon me if I tend to anthropomorphize—the mountain, to me, lives. And yes, suffers, bleeds.

There was a man and a woman in the lodge. Rowan stood defensively behind them. Guarding I don't know what.

I had only to take a look at the man to know I wanted him out of there. Little wonder Rowan had squeaked.

He was an Earther. His hands and face were a translucent, chalky white; evidently he'd caught one of the plagues we'd sent his way. Evidently, too, he'd lived through it. Some are like that. Natural immunes.

Pity.

The woman was also dressed in white. There was a caduceus on her collar: so a doctor or nurse. Or, I thought uncharitably, a companion perhaps. A lover. A whore. Who knows; she was anyway beautiful, with soft auburn hair and wide blue eyes.

"My name," the Earther said, drawing my attention back to him, "is Syl Barrister. I am an archeologist. I have read everything written about the Mountain of the Crown. In particular, I have read everything *you* have written about it. I want to climb the mountain, Dr. Kirst. I want to view the plaques first-hand."

In the last war—the space war—the Armageddon of all wars—we had proven to Earth we meant to keep our

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freedom. At the cost of maybe a billion lives. And at the cost of one life in particular, a girl named Jody, whose picture sits on my desk. So you don't have to ask why the outworlders shun Grand Old Terra.

That was a lot of years ago. They're coming off-planet again, the Earthers, and I suppose they'll be tolerated eventually—as long as they have money and keep quiet.

I said to Syl Barrister: "This is the season of *melte*. The snows are going and no one climbs the mountain of the Crown during *melte*."

Blue eyes—white face, the effect was startling. He managed a lop-sided grin and lit a cigarette.

"I know all about the *melte*, Dr. Kirst. First, let me ask—do you think I could climb the mountain unhindered in the midst of your tourist season?"

I shrugged. "Probably not. But that's the only chance you'll have."

He named a very large figure of money, raised his eyebrows inquiringly.

"Mr. Barrister, take your money and go home. Go back to Earth."

He doubled the offer. I felt my throat constrict. There were things I could do with money like that.

I said instead, "You can't buy me, Barrister. Don't try."

He appeared contrite. "Money means very little to me, Dr. Kirst. I am ashamed to say I thought for a moment I could use it to sway you into guiding me. Perhaps I should use another approach. Having read all that is written about the mountain, and after studying pictures of the plaques, I have arrived at certain conclusions. Would you be interested in hearing them?"

I snorted. "In a word—no! A month ago a priest tried to convince me a heavenly ascension took place here. He was looking for angelic footprints, no doubt. Before that a professor from off one of the Academy ships tried to persuade me this is *man's* birthplace. I've been here eleven years. I've heard everything. I'll stick with my own theories."

Barrister smiled tolerantly. "That a race of unknown aliens, the only sentient creatures other than man yet discovered, marked their passage through the ages on this mountain? And escaped the planet to seek their destiny in the stars?"

My smile was not at all tolerant.

"A simple theory, but mine own. Rowan will arrange for your passage off-planet. If you will excuse me. . . ."

The woman spoke for the first time. She had a husky, throaty voice. I liked it.

"Please do not treat Dr. Barrister like any other tourist out to have a good time. He has very good credentials—back on Earth."

"Then let him take his credentials back to Earth," I said. I turned to go.

"Dr. Kirst!"

I cast back one gimlet eye and stopped in my tracks. The woman was holding a little folding case so that I could see the crossed banners over

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spaceship that identified her as an officer of the Royal Navy.

"If the need arises," she said stiffly, "I can commandeer this site and order you to guide Dr. Barrister."

I came back and stopped in front of her.

"Who are you?"

She snapped a salute. "Major Aleta Fields, assigned to duty as physician and diplomatic liaison for Dr. Barrister. We are very concerned that he receive all possible cooperation."

Dandy. Just dandy.

"Well, major. In spite of any real or implied threats, I cannot take him up the mountain. It's not passable during *melte*."

"Have you ever attempted to climb during *melte*?" the Earther asked.

"There was never a need. When the snow comes, it is relatively easy to climb, and all the plaques are exposed. Thousands of people have climbed all the way to the Crown—during winter. With the spring thaw, the passages become choked with melting ice. There are mudslides. There is a very strong, gusting wind. The paths I'll take my tourists on next winter are, at this moment, covered over with skin-ice. Hazardous. Extremely. Are you an experienced mountain climber, Barrister?"

"The Mountain of the Crown is not high, as mountains go," he replied slowly. "And the slopes are such that mere beginners have little difficulty in climbing them."

"In winter!"

"Yes. In winter. And I wish to climb during *melte*. I do not believe it is insane, Dr. Kirst. I think it is . . . necessary." He spoke with such fervent conviction I was taken aback.

"Does your offer of money still apply?"

He smiled an apologetic smile. "Of course."

"And does the Navy permit me to take his money?" I turned to the woman.

"He offered it," she said icily. "You may accept it, if you wish."

"It's a rotten deal," I said, just as icily, "even with the money. But I'll do it."

Barrister gave a short nod. "Excellent."

"Provided certain conditions are met."

"What conditions?"

"First—I will not be responsible if Dr. Barrister meets a fatal accident. He knows the danger."

Before the woman could speak, Barrister bobbed his head.

"I agree."

"Secondly, we will not stay on the mountain after dark. There is too much likelihood of mudslides. It's easy enough to have floater pick us off at night and take us back in the morning."

"That sounds reasonable. Agreed."

"Okay. When will you want to begin? Tomorrow?"

The Earther shook his head. "I wish to do some reconnoitering on my own. Perhaps I could rent that floater you spoke of for a day or two."

"Be my guest." I handed them the

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standard booklet I give out to all the tourists. It explains how the mountain came to be discovered (by accident) and the work I'm doing translating the plaques. There are pictures of the mountain and of the Crown—that mysterious impressionistic sculpture that rests on a plateau at the mountain's top.

The mountain is exactly 10,104 feet high. It is not, as Barrister pointed out; any threat to Everest or Nix or K2, nor any of the other monsters that draw restless men to them. It is not steep, it is not particularly threatening; in fact, it is not even a challenge—when the snow is packed on its slopes.

The mountain is of interest only because of the plaques. And the Crown. Beginning roughly ten feet from the base is the first plaque, a squarish piece of alloyed steel. On it are crude symbols yet to be understood. At intervals other plaques appear, each more sophisticated in make-up. Near the top of the mountain the plaques have mathematical content that is readily discernible. Things like the electron number of hydrogen and oxygen and carbon atoms; even mathematical constants.

Approximately a hundred feet from the top is the Crown.

Think of a semicircular wall of steel twice the height of a man. Think of birds in flight. Think of a pulsating paralyzing vault to the stars that gleam like diamonds above the mountain.

I don't know what the creatures look like who built the Crown, and placed the metal plaques. I may never know. But I do know the spirit that took them on into space.

Perhaps they're waiting for us, somewhere out there.

The stone above the Crown has been tooled, as though awaiting more plaques, though none have been found. The *Pan Kirst Theory* says that space is for history yet unfolding.

I expect the aliens back.

That night there were rumblings from the mountain as rocks rolled and earth shifted. It sounded as though ghosts were walking around up there.

I have a picture of what the aliens look like in my head, based partly upon the distance between plaques, gravity, weather patterns, and the size of the symbols inscribed on the alloy. And based partly on imagination and dreams. Sometimes I think I see them, in the valleys and ravines of the mountain, tall furred creatures busy at their tasks, ignoring the humans who struggle up the slopes in their awe-struck thousands. At times, when the mountain talks, they seem very real and close, those voyagers of yesterday.

Barrister was gone in the morning, taking the woman and the floater. I was happy for the respite. I ate a quick breakfast with Rowan, and then dug enthusiastically into the mysteries of alien culture. There were some new approaches I want to try on plaque 72. Outside, it began to rain, and the ice heaved. Far off like a blast the

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slopes of the mountain growled as ice packs nudged down.

At dinner both Barrister and Major Fields were quiet, their attention absorbed by Rowan's cuisine. They didn't speak of their trip in the floater (they returned from the west) and I didn't inquire.

Ask me no questions, and I'll tell you no lies.

Only afterwards, when the light had begun to fade and the first stars splashed their glory over the valley, did anyone attempt to make conversation.

Barrister lit one of his cigarettes. "I think perhaps tomorrow we can begin the climb. Does that suit you?"

I shrugged. "You're paying the freight. You get the grand tour anytime you say."

"Has the rain increased the hazard?" There was a worried frown on Aleta Field's pretty face.

"Major, Crown Mountain—the Mountain of the Crown, has all the character of a dirty old man. An evil old man. If you leave your window open tonight, and listen, it will talk to you. It will say that if it can, it will crush you—brutalize you. Listen to the ice sliding around up there; you'll become aware the thing has a life all its own."

I had made an impression. Her face tightened, then grew hard. Her windows would be locked that night.

Not so Barrister. He was interested. He had followed every word with an inquisitive sidewise tilt of his head.

"Mountains have personalities, too, Dr. Kirst. It is so on Earth, and it is so here. I have heard of killer mountains. Is this really one of those?"

Major Fields was white-faced. "Excuse me," she said. Her back was ramrod straight as she left.

I smiled gloomily at Barrister. "During tourist season, it's a benign old man, all ample lap and frosty white hair. In the time of *melte*, however, it feels its youth again. It becomes uncontrollable. I don't know if it's a killer, Barrister. I expect we'll all find out tomorrow."

He snubbed out his cigarette. "I expect so." He shot me a tight grin and we listened for a moment to the sick cleavage of ice above us on the slopes.

"You don't know," he said finally, "how I'm looking forward to this climb." He gave me a last look and wandered slowly off to bed.

I spent a half hour mulling over the situation, trying to find a pattern where the Earther fit. None came to mind. I walked down to the lab, poured myself a drink, and got undressed. I was crawling under the covers when the phone buzzed. Cursing, I swung a shoe, missed, and finally hooked the thing with a thumb. I punched receive, and heard Major Fields' soft voice.

"Dr. Kirst, I've been waiting to talk to you."

"Talk to me in the morning," I said shortly. "Wait!"

Something in her voice made me hesitate. Finally I sighed, and half sat

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up. "Go ahead."

"Had you ever heard of Sylvan Barrister before yesterday?"

"No," I said emphatically, "and I hope I never do again. I don't like Earthers."

"He's special," Major Fields said. "He was one of Earth's tacticians during the war."

I didn't answer. A tactician was one who directed battles, maneuvered whole fleets, sacrificed planets. He was a player in a four-dimensional chess match, where the rules had been forgotten. Really, the entire war had been fought by tacticians, rarified intellects protected and pampered, locked away safe from the holocausts they visited upon others. I sat in the darkness and thought about Barrister. He could have ordered the strike that destroyed Jody. *Pawn to bishop four.*

I drew in a long breath. Time to get hold of myself. The woman on the other end of the phone had not said anything for at least three minutes. God, I thought, how I loathe tacticians. And with very good reason.

I had been one of the best.

"Why is he here?" I asked. "Is he legitimate; is he really an archeologist?"

"He's been a full professor for five years," Major Fields said. "The problem is we don't know what else he is. He may be genuine, or he may be looking for something to give Earth an edge again."

"Why not just tell him to stay home?"

"When we have our own tactician right here? It's too good an opportunity to miss. We want to find out what he's after—if he's after anything."

"Why here?" I wondered aloud.

"You tell me."

"Hmmm," I hung up the phone and crawled under the covers. I didn't go to sleep for a long long while.

Morning: there were fog streamers hung like bunting across the mountain's flanks. The slopes looked festive, expansive. It was as though the mountain was deliberately calling me a liar, welcoming us instead of challenging us.

We moved smoothly at first, the woman just below me and Barrister further back, roped together in a traditional intimacy none of us were comfortable with. We were also linked into a communication net that included Rowan back at the lodge, in case we needed help.

It was a strange feeling, this trespass of the mountain's slopes. It was as though I'd caught it naked, having gotten used to it in winter's clothing. I'd traversed this same route times forgotten, leading my dreaming sheep, unaware of how red the stone, how very white the clay.

We stopped briefly at each plaque. Barrister looked bemused, more interested in the feel of rock and steel against his hands than the message hidden in the glyphs.

At three hundred feet or so we met our first patch of skin-ice. It crackled like thin glass under our feet and we advanced cautiously, making sure our

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spikes were anchored securely.

I heard Barrister say: "It is my theory, Dr. Kirst, that the mountain was *meant* to be climbed during *melte*. Do you find that laughable?"

The notion had never crossed my mind. I considered it now, grasping a ledge of stone and pulling myself up.

"Do you have any particular reason for thinking so?" I asked cautiously. I was beginning to get the idea that Earther or not, Barrister had put in some research time.

"Yes. I've studied weather printouts for the past dozen years. They are unvarying, they show a greater wind velocity during *melte* than at any other time."

"The spring mistral," I said. "We'll run into it further up."

We climbed some more, and finally Barrister took up where he'd left off.

"The mountains west of here seem to act like a giant flume for that wind, funneling it along."

"So?"

"That's where I went yesterday. I examined those mountains. They've been deliberately shaped to bring that wind."

I was silent, climbing, getting the feel of the slope. Kicking myself. I had noticed the carved mountains at least five years before, but had not tied them to *my* mountain. My respect for Barrister went up a grudging notch or two.

"Go on, please."

"That was a job of some considerable engineering. Why was it done? Since it is a warm wind, my conclusion was that it is to melt the snow on Crown Mountain."

"And by doing so make it easy for them to climb?"

Glancing downslope, I caught a glimpse of a half-smile.

"Perhaps," he said. "Although perhaps not, as well."

We had climbed over two thousand feet, and began to feel the first puffs of the mistral. This low on the mountain it left a sensual kittenish impression. Up higher, I knew, the kitten would bare her claws, and become a sabretooth.

The plaques at this altitude were still faintly primitive, made up of simple and recurring symbols. Something resembling a skewed shield, for example, accounted for nearly a quarter of the glyphs as we approached plaque 210.

Barrister and the woman eased up beside me, and the Earther ran his hands over the plaque, examining it minutely.

"You don't know," he said, looking up at me, "how often I wished I was up here, actually *touching* these works." He smiled again, faintly. "They are a long way from Earth, in more ways than simply the physical."

I found myself grinning tightly, staring at his too-white face. A hundred battle, billion-casualty wall existed between Earth and these alien tracings. I felt momentarily sorry for him, trapped on his tiny home like a rat in a warren. Then it passed, as I thought of Jody, and I gestured upward, where there came a rattle of

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wind-tossed stones.

"We have at least three good hours left before nightfall. Let's make the most of them."

"Shouldn't we stop to eat?" Major Fields asked. She looked a little tired already. I glanced at Barrister, who had climbed the first three thousand feet as easily as I. He appeared fresh and eager to continue.

"I can have Rowan take you off in the floater," I told the woman. "There's no need for you to continue, if you don't choose. You there, Ro?"

Rowan's clipped tones sounded in our earphones. "Right here, Pan. You want me to bring up the floater?"

The woman stared at me in tight-lipped silence. Unused to climbing, she was more a menace than an asset. The last five hundred feet she had been dragging against my harness.

I said, "You can watch us on the telescope. We have one hooked up to a monitor unit—and you can stay in the net; you'll hear everything that goes on."

She turned to Barrister, but he only nodded a little sadly. "He's quite right, my dear, perhaps that would be best."

She turned back to me. "Dr. Kirst, in spite of any agreements with Dr. Barrister, I must inform you that he is under the protection of the Royal Navy. I will be watching you very carefully." Her eyes looked a little wild.

"Fine. Ro, bring up the floater."

"Yes, sir. Coming up."

While we waited, the Earther sank down on his haunches, his fingers running ruminatingly over the alloyed plaque.

He saw me watching, grinned self-consciously. "You know, we had several computers dedicated to these glyphs at the university. But, as is sometimes the case, our biggest breakthrough came from an independent researcher."

"Oh?"

"Yes, indeed. From your own book, Dr. Kirst. *Translations Out of Time*."

I was startled, rather than pleased. That book had been written in a flush of youthful enthusiasm, with a new bride on my arm and a universe fresh as a flower waiting to be explored. I wrote it, and forgot it, and then the universe crumbled into ashes around me.

As I remembered, I had concentrated on a half dozen or so of the plaques, throwing away the rules and reaching for the poetic in an effort to understand them. It was a throw-away book, a teaser, a mere think-piece.

But Barrister was saying: "That work was inspired, Dr. Kirst. It was unfortunate that so many years went by with uh . . . interruptions, before it came to my attention. In any event, allow me to congratulate you."

I told him to skip the congratulations and leaned against a slab of flat brown stone. Rowan arrived and took Aleta off. I saw her go with relief mixed with something else. Perhaps she brought the war with her, even

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more than Barrister.

Just the two of us linked now, the only sounds we made as we trudged upwards was an occasional grunt and hissed intake as we fought for footing on the ice.

Above four thousand feet the mountain was encased in a sheath of wet-glaze. It was like an irridescent jewel under our feet. Water rolled over it, forming little rivelets around our boots. Sometimes pieces of it broke away, skittering down behind us with a sound like chinese bells.

The wind now blew in pillowy gusts, plucking at our bodies and threatening to dislodge us.

"Keep moving," I said to the Earther. Above us was a plateau, a wide shelf nearly fifty feet across where we could rest and prepare for further ascent. There was even a portable comfort station set against the cliff face, for my tourists.

"Right," Barrister said. He seemed hardly out of breath . . . perhaps he'd prepared for this climb on Earth.

"What is the height here?" he asked as we made the plateau. The wind was gusting heavily, then quieting. Our contact with the wet ice had left us soaked and uncomfortable. Nightfall was at most an hour away.

"Just over five thousand feet. Halfway."

He nodded. "Perhaps we should begin here in the morning. It looks as though it is more or less a straight run from here."

"There is a saddle at seven thousand, six hundred feet. For the rest of it, we'll be exposed on the slope. Just beneath the Crown, there is a relatively easy traverse. But there is the wind—and the ice."

"Yes," he said, "and they will both get worse."

I called down to Rowan. "You listening? Come get us. We're calling it a day."

"On my way," Rowan chirped.

While we waited, Barrister leaned against a shoulder of rock and lit one of his cigarettes. With a sharp glance at me he removed himself from the comm net.

"I know all about you," he said. "Your war record, your work here, translating the plaques. You've earned quite a reputation."

I shrugged, watched him blow streams of smoke through his nostrils. "What's the point?"

He looked out over the valley for a moment without speaking. Then he said, "The point is I envy you, Kirst. You've found something most of us hunt for all of our lives. Purpose."

"You mean the mountain?"

He nodded, his lips twitching with wry humor. "You've made it your life, haven't you? Your reason for being?"

I looked at him. His white face was ghost-like, at home with the other ghosts on this mountain.

"I've translated six of the plaques," he said. "The ones from your book. They tell an interesting story."

"Go on."

He drew on his cigarette, flipped the remains away. Watching it spin

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away down slope, I touched the button that cut me out of the comm net. He noticed the movement and gave me a sardonic blink.

"The aliens climbed during *melte*, or so say the plaques. When you think about that, it has a certain logic. Climbing the mountain during *melte* is not an easy thing. Upward struggles seldom are, for mountain climbers, *or* for a race of people."

I took the news badly. The plaques had been mine too long; I did not enjoy sharing them—even if my book had provided the key. My stomach knotted and my fists clenched. I turned my back on him and walked to the edge of the plateau. The thought came to me that he was trying to steal the mountain from me, trying to shrink it to a size small enough to match his own small dimensions.

"What else did the plaques tell you?"

He lit another cigarette. "You were right in your assumption. The Crown is a site of Exodus. A stargate. The aliens are somewhere out there." He pointed one finger at the lowering sky.

"You haven't published?" I asked.

He gave me a buddha's smile.

"No."

"Why not?"

"I had to see where the mountain would take me. The plaques reveal the way, not the destination. I had hoped you . . ."

I stood waiting, watching him. After a moment he completed his thought. "I had hoped we could work together. Collaborate."

I didn't even have to think about it.

"No."

"Because I was a tactician?" He raised his eyebrows and his pallid features reminded me of a clown's face I'd seen once as a child.

"Maybe?"

"Or is it because I'm invading your domain? Poaching from your private preserve?"

"Maybe that, too," He was too accurate in his assessments to suit me. I saw a speck rising, far below, glimmering in the failing light. I switched myself back into the comm net. "Get that crate up here, Rowan," I croaked. "Get me the hell off this mountain."

Dinner was dismal, a failure. When it was mercifully over, I returned to my lab, poured myself a stiff drink, and dug around in the tumble of books until I found a copy of *Translations Out of Time*.

It gave away no secrets. I could not recapture the poetic energy I'd had eleven years before, the elusive mood of naivete and creative intuition. After two hours I sagged against a bench and let an attack of nerves turn me into a quivering jelly. I heard someone come in.

"Hey doc, you okay?" Rowan grabbed me under the arms and lifted me up.

I managed a weak grin. "Sure, Ro. Nothing a pill or two won't take care of."

"Sure, sure," he said. He lowered

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me into a chair and dug a tranquilizer out of the little medicine chest in the bathroom. He watched me take it, concern written all over his face. My old and faithful retainer.

Abruptly he snorted. "Earthers! Nothing but trouble. What is he after, anyway?"

"He's after the mountain," I said. "But don't worry. He's not going to get it."

Late in the night I heard footsteps crunching on the gravel walk. They were not Rowan's—those I could identify. Not the Earther's, he had a long even stride. The woman, then, come no doubt to tuck me in.

When the footsteps stopped I threw open the door.

"You wanted to see me?"

Her face was an ivory oval. She smelled somewhat of jasmine. Her hair was combed into a dusky swirl.

"Yes."

I held the door. "Come on in. Excuse the clutter."

Inside, she stood looking about, measuring me against the books and plaster reproductions of all 990 plaques; the steel desk with its nests of instruments, the rumpled army cot.

She touched one of the plaster plaques. "What have you learned from this?"

I dug out a bottle of brandy and found a glass that had been washed only a week earlier. I poured her two fingers, found another glass, poured myself the same.

"That," I said, "is plaque number eight-oh-five. As nearly as I can determine, the oblong wheels represent wisdom. The curliquelike stamens indicate time. I surmise the plaque tells a story, perhaps the local equivalent to the *Sermon on the Mount*."

She sipped her brandy. "I'm sorry I was so . . . official, today. I really do not like playing nursemaid to an Earther."

I gave her a winning smile. "Think nothing of it."

She appeared relieved. With a tilt of her head she asked, "Have you found out if Barrister is interested only in the plaques?"

"Yes. He's translated six of them. Brilliant work."

"Oh. You've seen the translations?"

"No. He wants me to work with him, share the discovery."

She took another sip, her eyes growing large behind the rim of the glass.

"That would suit us fine. We'll find out what he knows."

I shook my head. "Not even the Royal Navy could induce me to collaborate with him. Besides, I have only to study my own early work to know what he knows. He gave that much away."

"Then he's not working for Earth?"

I shrugged. "If he knows how to activate the Crown—the stargate, that will certainly raise Earth's prestige. And if the stargate opens trade with the aliens, Earth will inevitably benefit."

"How do you know the aliens would

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welcome trade?"

I shot her a smile. "We don't know. The only thing we can deduce is that the aliens are very macho. Evidently they pride themselves on overcoming difficulties. That mountain out there—it's a kind of rite of passage. Climb it during *melte*, prove yourself worthy."

"Worthy of what?"

"That's what we hope to find out tomorrow."

She finished her brandy. "Don't trust Barrister," she said. "He knows more than he lets on."

I hid a smile. She was an arsenal of seduction. And transparent as new glass.

"As a matter of tactics," I said, "I shall watch him very carefully."

I did not sleep well. My dreams were peopled by furry phantoms, and above me the mountain grumbled secretively. I was apprehensive. I did not want the morning to come.

It came anyway. When the pearl opalescence of dawn wove its net above the horizon, I woke up. There was a sheen of sweat across my forehead. With foreboding I dressed, went to the lodge to wake the Earther.

Halfway there, the door of the lodge flew open. Major Fields saw me and stopped. Panic lines were etched in her face.

"It's Barrister—come quick! He may be dying!"

He wasn't dead yet, but he was close to it. His skin had taken on a papery texture, and his temperature was through the ceiling. It was obvious he was in great pain. I stood and watched while the woman bathed him with cold water and injected sedatives into his bloodstream.

"This is the reason a doctor was assigned to him as liaison," she said, glancing up at me. "This attack is a side effect of the plagues used against Earth. It's recurring, like malaria. There seems to be no cure for it, and if it doesn't kill him this time, it probably will eventually."

I didn't say anything. I had directed those plagues.

He did not die. He hung on, fighting for breath, the fever raging through him. When he was awake his face was masklike, revealing little. When he was unconscious, the muscles around his mouth relaxed; he became vulnerable, human, a victim of life like the rest of us.

We watched him closely. Twice he went into paroxysms of choking, and both times Aleta brought him back from the edge.

At midday, Rowan brought in a meal of steak and potatoes and coffee. We sat wolfing it, glancing now and then at the figure on the bed. The constant tension had taken its toll of the girl. She looked tired. There were circles under her eyes.

"Will he make it?" I asked, sipping coffee.

She gave a little shrug, put down her own cup. "He seems a little stronger now. He'll recover, barring complications."

I suddenly thought of something.

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The mountain. Out there waiting for us.

"Barring complications," I said, "how long before he can climb again?"

She shrugged again, brushed back an errant strand of hair. "It depends on him. Two weeks. Three at the outside."

Time enough. Perhaps.

I stood up.

"I've got to go. There's a chance I can beat Barrister to the stargate."

She took another sip of Rowan's coffee and thought about it. When she had it, she said, "Can you really translate all six plaques in that time?" She gave me an uncertain smile.

"I've got to try," I said. "Let's hope he doesn't recover too soon."

She seemed to relax. She studied her reflection in the bottom of the coffee cup.

"I won't delay his recovery," she remarked at last. "I couldn't do that."

I shook my head. "I wouldn't ask you to. Bye."

"Bye."

I hurried back to the lab. Outside its door I paused and looked up at the mountain. Ice clattered against a rocky slope, mushed lower into a valley. I imagined I saw furry movement and grinned at my self-indulgence.

Two weeks, she'd said. Three at the outside.

I used the time. I examined the plaques the Earther had translated, reread *Translations Out of Time*, and zeroed in on a few of the more comprehensible glyphs.

Aleta joined me when she could get away, those times when Barrister was asleep. She brought carafes of coffee and bottles of brandy, cleaned my pig sty into a manageable clutter, and played Capulet to my Montague.

We became lovers.

I had no objections, really. She was warm and soft and tended not to talk too much. She never intruded on my memories of Jody, and seldom got in the way when I was working.

The plaques were a puzzle. There were times when I nearly collapsed, my mind numbed with effort. But I was making headway. The plaques were of two parts, the first evidently a preamble, a courtly welcome, like heralds trumpeting the approach of royalty. It pointed ahead. It promised the keys to the stars.

The second part was more difficult. Bedrock after loam. I chased syntaxical phantoms in my dreams, awoke to black coffee and the work bench. As I chased trains of thought into dead switching yards, my respect for Barrister grew. The mind that was capable of penetrating these densities of thought was deserving of the sincerest admiration.

The Earther had survived the worst of the attack. Though weak, he was recovering. I stopped in once, found him sleeping. I was amazed at how gaunt he appeared. His cheeks were sunken. His head had the aspect of a whitened skull. Lesser men, Aleta assured me, would have given up long ago, but the Earther had an unbend-

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ing will of iron.

His recovery was swift. He wasn't leaving me a lot of time. I persuaded Aleta to shoot me full of stimulants, and I didn't sleep for two days. Little use. The glyphs were an impenetrable forest, an unscaleable cliff. They defied and then defeated me.

I bottomed out.

Done.

Finished.

We sat drinking brandy, she dressed less than coyly in a sheet off the army cot.

"Barrister took solid food today," she said. She reached out a finger, ran it over the stubble that graced my chin.

"Good for him," I said. I knocked back the brandy and stood up. Getting drunk was not the answer. I felt lost and bleak and empty.

"There's nothing left to do," I told her. "He's beaten me." I hated the way it sounded, hated myself for saying it.

She didn't say anything at all. After awhile she just reached out her hand, and I took it.

In two days Barrister was walking, eating huge meals from Rowan's kitchen, gaining strength, looking up at the mountain, squinting at the sliding ice.

There was one last thing I hadn't tried. In the throes of desperation I went back eleven years, kissed Aleta hard on the mouth, threw out the rules, and reached deep inside myself from desperation for . . . for whatever was left of the poet.

In this universe God is creator, Kirst (cursed) is the created.

Pun intended.

At the end of thirty-six hours my mind was fragmented, shadows took on life, colors swam in front of my eyes. I was on the edge of madness.

Maybe that was what was needed.

I found the threads that ran through the glyphs, ran them down, skeined them into fabric.

There was not one key. There were many.

Aleta touched my shoulder.

"Pan. Barrister wants to finish the climb now." There was sadness in her voice.

I looked into her face, saw myself reflected in the blue of her eyes. I was taken aback. What crazy man was this?

"Tomorrow," I said. "Tomorrow." I stood up, caught her arm for support, and stumbled to the cot.

"Pan, did you hear? He's getting impatient. He wants to climb the mountain."

I patted her hand. "Fine. I did it, Jody. I did it."

She lowered me, swung up my legs. "I'm not Jody. I'm Aleta."

I stretched out on the cot, touched her cheek, mumbled on for awhile, telling her about the aliens, about the key to the stargate. After awhile darkness flooded in. The universe vanished.

Rowan woke me up, in the hour just before dawn.

"Sir! Barrister has gone. He's taken

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the floater—and the girl."

Damn!

They were visible on the telescope monitor. They left the floater on the plateau and began the last half of the climb. As we watched, a finger of light edged above the eastern rangeline. Day had begun.

The mountain had lulled us earlier. Three hundred feet above the plateau an ice slide sent Barrister and the woman scrabbling crabwise to the low shelter of an outcrop of stone. In its lee they hung on their ice-picks, letting the ice sweep over them like a ragged waterfall. They had removed themselves from the comm net, and there was nothing we could do but watch.

When the ice slide stopped, they tied a rope around the stone outcrop and rested, letting their nerves recover. Barrister lit one of his cigarettes, blew smoke to the four winds. Guessing he was being watched, he swung his white face toward us. A smile touched his lips.

I told Rowan about the stargate, saw his mouth grow grim.

They climbed through the morning, and the mountain began to show its claws. The wind picked up, blowing malevolently, making them dig in their picks and anticipate each step. There were more ice slides, though none close enough to pose a threat.

Sipping a mug of Rowan's coffee, I said, "The stargate only opens during *melte*, and then only if certain key plaques are touched. If you will notice, Barrister is following a pattern."

Rowan peered at the monitor. "Isn't there anything we can do?"

I took another sip of coffee.

"I'm open to suggestions."

Once they passed the seven thousand foot mark, the mistral was a bludgeon against their backs. The rock face was torn and buckled. They crept forward, edging onto a smooth face that was cleared of snow. They were nearing the traverse just below the Crown.

I had to admit they showed courage. They never faltered, never looked back. Once the wind blew Aleta off her feet, and she dangled at the end of her rope, banging cruelly against the cliff. Slowly, Barrister began to pull her up, and finally she regained purchase.

The Earther looked exhausted. The illness, I thought, must have weakened him more than he knew.

A few minutes later they disappeared over the lip of the plateau. They had made it to the Crown. They had fulfilled their own particular rite of passage. And in rather heroic fashion.

"Now what happens?" Rowan wanted to know.

I heard the mountain grumble. "They've activated the stargate," I said. "Up there on the plateau there will be a line of footprints leading to the Crown. They'll stop there."

I thought of Aleta, of Jody. The two whirled around in my head. I thought of Barrister, and found not hate but grudging admiration.

I took another sip of coffee.

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It was evident now Barrister had never translated those plaques, only the preamble. He'd arranged this whole elaborate charade in order to make me translate them. Even to the point of nearly dying—you don't fool a tactician by doing things in halves.

He had known me so well. And known me not at all.

The memory of Aleta came back sharp and bittersweet. It's too bad, I thought, she nearly had me convinced. If he'd given her a little more time . . . I shrugged . . . she had to be part of it, she was a logical extension of the Earther's plan.

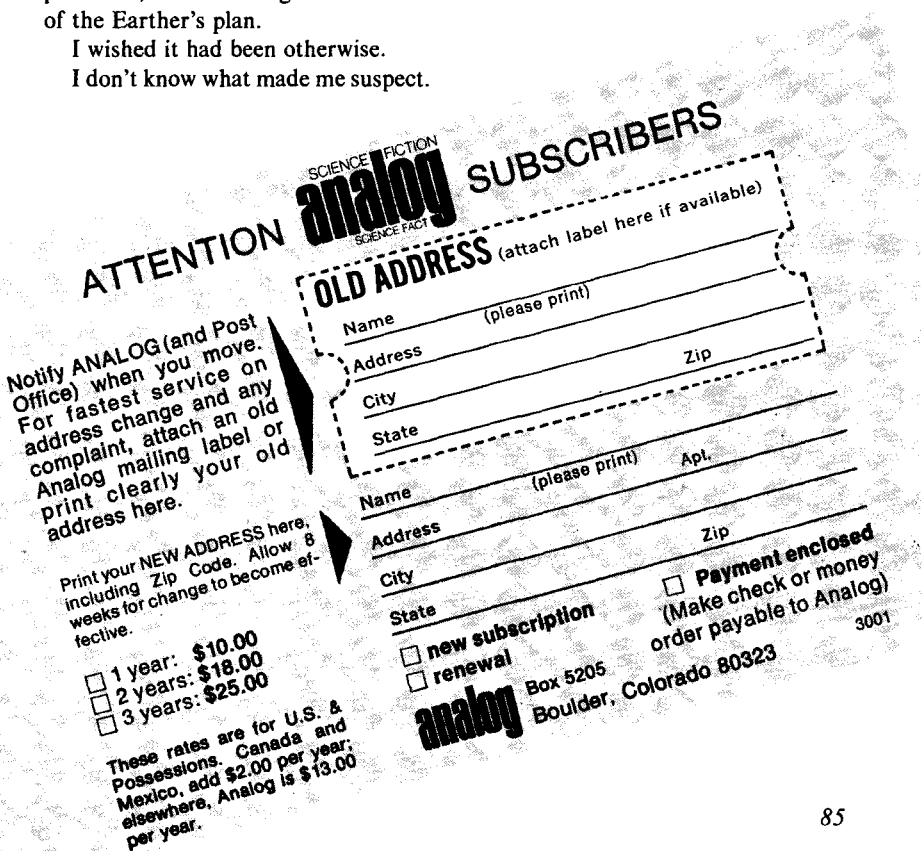
I wished it had been otherwise.

I don't know what made me suspect. Perhaps it was only a carry over from the old days. A tactician has to be a cynic by trade.

I glanced up at the mountain. According to the translation I'd done, different combinations of plaques resulted in the stargate opening to different worlds. The combination I'd given Aleta opened the stargate to one particular world.

A methane-ammonia giant.

Sometime, appropriately attired, I would have to go and get them. Even being Earthers, they deserved that. ■



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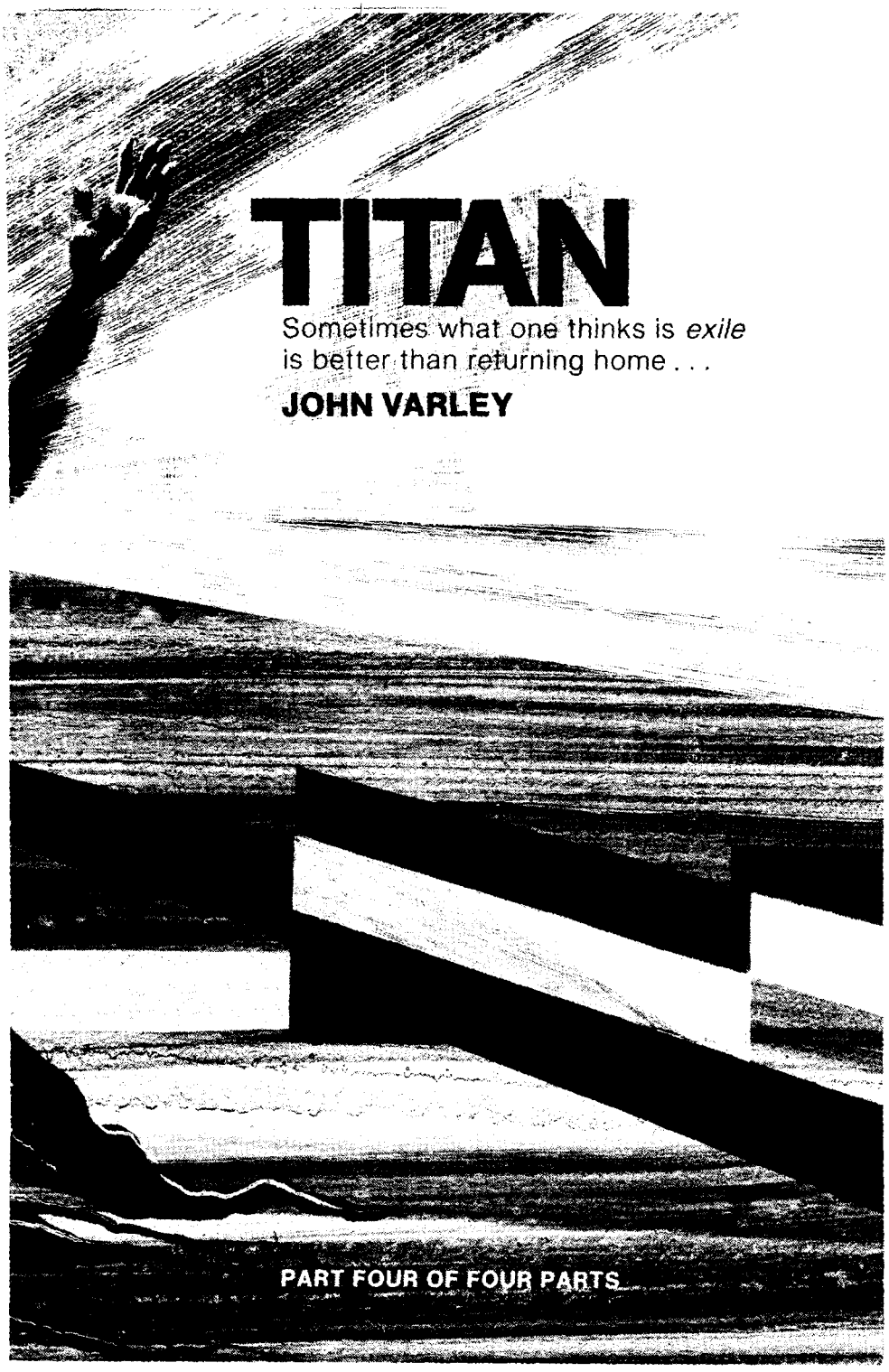

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SYNOPSIS

The year is 2025. DSV Ringmaster *is on the first voyage of exploration in the past eleven years. The destination is Saturn, and the Captain is Cirocco Jones, a thirty-four-year-old veteran astronaut. There are three men and three women under her command:*

First Officer William Rubin, forty. Rubin functions as ship's engineer, and during the trip has become romantically involved with Captain Jones.

Satellite Exploration Module Pilot Eugene Springfield, twenty-nine.

Medical Officer Calvin Greene, twenty-six.

Gaby Plauget, twenty-eight, astronomer.

April 15/02 and August 3/02 Polo, two of five clones of their Nobel Prize-winning mother, Susan, who handle geology, chemistry, and physics between them.

The monotony of the trip is interrupted by Gaby's discovery, while still some distance from Saturn, of an eleventh moon. She names it Themis, and soon finds it is no ordinary moon. It is almost certainly an artifact: an interstellar spacecraft, or a colony world. But who built it, and where are they now?

Themis is shaped like a wagon wheel. There is a hub with a hole in the center. Radiating from the hub are six spokes, connecting to a vast torus, thirteen hundred kilometers across. Solar heating fins hang beneath the torus, and above it are six square mirrors which channel sunlight down to windows in the "roof." The torus is hollow, and the spin rate would produce one-quarter gravity on the inside.

Ringmaster's *mission profile is quickly scrapped, and Cirocco is ordered to orbit Themis. This proves difficult because of its odd shape, but she manages to station her ship beneath the torus.*

She wonders how she is going to enter it, but Themis makes the decision for her. A gigantic grapple seizes Ringmaster, *destroying it. Smaller grapples gather every piece of debris, including the crew, and they are swallowed up. There follows a period of complete sensory deprivation. Cirocco believes she has been eaten by a giant animal, and in time is expelled from beneath the ground, naked and hairless. Only the metal parts of her suit have survived.*

With the remains of her suit radio Cirocco contacts Gaby, and the two soon get together. Gaby has been changed by her sensory deprivation; she is no longer interested in astronomy, and she believes she is in love with Cirocco. The two women find a stream winding through dense jungle and begin to follow it. They have little sense of time, as any point inside Themis is always in light or darkness, depending on its location. They are in a region of daylight, a perpetual afternoon. The climate is temperate, but they encounter a sudden wind accompanied by a deep moaning sound followed by a snowfall. The snow melts rapidly on the warm

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ground.

The stream leads them to a two-kilometer cliff, where they discover they are near one wall of the torus. From their vantage point they can see almost half of the interior curving up on either side of them. Sprouting from the land are huge cables that vanish through the roof.

As they are looking, they hear a voice from overhead. It is Calvin Greene, sitting in a tree.

Calvin has been listening to them, but could not reply because his suit mike was destroyed. He, like Gaby, has been changed by isolation. He awoke knowing how to communicate with a species of living blimps. He introduces the women to one named Whistlestop, and proposes that they ride to the base of the cliff, where Bill and August are camped. Gaby is reluctant, having acquired a phobia of being eaten alive, but goes when she realizes it is the only way of staying with Cirocco.

The blimp can make parachutes, which the three use to join Bill and August. But no sooner are they on the ground than Calvin announces he will be leaving on his own. He no longer desires the company of humans, preferring to be with the blimps. He leaves, taking August to help her search for her sister.

Cirocco, Gaby, and Bill build a boat—the Titanic*—from a large nutshell, and begin to sail down the Clio to the central river of Themis, the Ophion. They have named the day region they are moving through Hyperion, and the night areas on each side are Oceanus and Rhea. Oceanus is dominated by a vast frozen sea.*

On the way, Bill's leg is broken in a fight with a mudfish. When the women get him to shore, they encounter centauroid creatures called titanides. To her astonishment, Cirocco finds that she can talk—or rather sing—to them. She has learned the language in a way she does not understand while inside the creature that ate her ship.

A healer is summoned. After a period of indecision while Cirocco worries if the titanide medicine will do more harm than good, Cirocco lets the treatment begin.

Bill responds well. The human party begins the short trip to the titanide settlement, Titantown. On the way, Whistlestop arrives in response to Cirocco's summons. Calvin parachutes down, followed by several titanides, August, and Gene, who has been found wandering alone in Rhea. But before any of them reach the ground the titanides are attacked by winged humanoids called angels. A brutal battle ensues, leaving many titanides dead.

Meistersinger, the chief titanide, explains to Cirocco that they have no control over the murderous impulses that seize them when angels appear. The conflict seems locked in their genes. In spite of this, Cirocco offers to try to mediate a treaty. She had previously decided to attempt a climb

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up one of the cables to the hub, hoping to find the machines or beings who might still be in control of Themis. The titanides believe the hub is where their goddess—called Gaea, which is also the titanide word for the whole world—resides, so Meistersinger agrees. Cirocco does not believe in Gaea, but her trip will take her through the spoke, where the angels live.

She and Gaby set out with two titanides, Hornpipe and Panpipe, to explore the cable base. The cable emerges from the ground at a thirty-degree angle, becoming steeper as it rises before vanishing into the funnel mouth of the spoke high above Rhea. Cirocco decides the climb will be possible, though hardly easy.

But on the way back there is another angel attack. Gaby and Cirocco restrain Hornpipe by binding her legs and holding her ears so she cannot hear the cries of the angels as they pass on their way to Titantown, but Panpipe breaks free and is killed.

Cirocco decides to take only Gaby with her on the climb. They gather provisions and fly in Whistlestop to a point on the cable where it passes into the twilight zone. They begin to climb.

Just when the cable is becoming too steep to cling to, they find a staircase and begin winding around and through the five-kilometer diameter of the cable. They pass through one edge of a gigantic valve, and emerge in the three-hundred-kilometer high interior of the spoke.

CHAPTER EIGHTEEN

It was roughly two hundred and fifty kilometers around the base of the spoke. They began to circumnavigate it, looking for anything from a rope ladder to an antigravity helicopter. What they found was horizontal trees, growing in the vertical forest.

When they penetrated the outer branches and followed the trunks to their roots in the wall, they had to climb a gradual slope made of fallen branches and rotting leaves. The real substance of the spoke was a spongy gray material. It yielded like soft rubber when they pressed it. When Cirocco pulled a bush from the wall a long taproot came out with it. The wall bled a thick, milky fluid, then closed around the small hole.

There was no soil, and very little sun; bright as it had seemed when they came out of the dark staircase, the real light level was quite low. Cirocco assumed that, like many of the plants on the rim, these depended on subsurface sources for life.

The wall itself was moist and supported growths of moss and lichen, but few intermediate-sized plants. There were no grasses, and what vines existed were parasitic, rooting in the tree trunks. Many of the trees were the same species they had seen on the rim, adapted for a horizontal existence. There were familiar fruits and nuts growing on them.

"That takes care of the food problem," Gaby said.

There could be no rivers in the spoke, but the wall glistened with tiny

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trickles. High above, spouts could be seen, arching out and turning to mist long before they reached the floor.

Gaby looked up at them, noting that they seemed evenly distributed, like lawn sprinklers.

"So much for dying of thirst."

It began to seem that the climb would not actually be impossible. Cirocco found it hard to be elated about it.

Excluding the possibility of a staircase—which she quickly concluded they would not find, since the trees prevented a close exploration of the wall—there were two ways to the top.

One involved climbing the trees themselves. It should be possible, Cirocco reckoned, to go from branch to branch out where spreading had meshed the branches of one tree with those of its neighbors.

The other possibility was a straightforward job of moutaineering. They found that their metal spikes could be driven into the wall surface simply by holding them and jabbing.

Cirocco favored the wall, not wanting to trust the trees. Gaby liked the branches, which would be quicker. They debated it until the second day, when two things happened.

Gaby noticed the first thing while looking out over the gray floor of the spoke. Her eyes narrowed, and she pointed.

"I think that hole's not there anymore," she said.

Cirocco squinted, but could not be sure.

"Let's climb up and take a look."

They roped themselves together and began ascending through the branches.

It was not as bad as Cirocco had feared. Like anything else, there was an optimum way to go about it, and they quickly discovered what it was. There was a line to pick between the thicker branches closer to the wall—which were rock solid, but tended to be too far apart—and the thinner, more willowy ones farther out, which provided a thousand places for hands and feet but sagged under their weight.

"A little farther in," Cirocco called ahead to Gaby, who had taken the job of scouting the path at the end of a five-meter tether. "I'd say about two-thirds of the way to the top of the tree is about right."

"In, top," Gaby said. "You're mixing your directions."

"The bottoms of the trees are in close to the wall. the tops are out in the air. What could be simpler?"

"Suits me."

After climbing through ten trees they began to work their way out to the top of the last one.

When the branches they walked on began to bend, they tied a line to a strong one. Now the sag worked to their advantage, as it opened a window in an otherwise impenetrable wall of foliage. They had chosen a tree that, in a horizontal forest, would have towered above its neighbors. In the spoke it had to be content with jutting further from the wall.

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"You were right. It's gone."

"No I wasn't. But it will be in a minute."

Cirocco saw what was left of the hole. It was a tiny black oval in the gray floor, and she could see it contracting like the iris of an eye. From below, the only time they had a good look at it, that hole had been nearly as large as the spoke itself. Now it was less than ten kilometers across, and still closing. Soon it would seal around the vertical cables that emerged from its center.

"Any ideas?" Gaby asked. "What good does it do to close the spoke off from the rim?"

"I haven't the faintest idea. I presume it will open again, though. The angels got through it, they come through regularly, so it . . ." She paused, and then smiled. "It's the breath of Gaea."

"Say again?"

"It's what the titanides call the wind from the east. Oceanus brings cold weather and the Lament, and Rhea brings hot air and the angels. So you've got a tube three hundred kilometers high, with a valve on each end. You could use it as a pump. You could create high and low pressure areas, and use them to move air."

"How would you go about that?" Gaby asked.

"I can think of two ways. Some kind of movable piston to compress or rarify the air. I don't see one, and I sure as hell hope there isn't or it'd smear us."

"If there was, it wouldn't have done these trees any good."

"Right. So it's the other method. The walls can expand or contract. Close the bottom valve and open the top one, expand the spoke, and you draw air in from the top. Close the top and open the bottom, put on the big squeeze, and you force it out over the rim."

"Where does the air that comes in the top come from?"

"It's either sucked up through the cables—some of it must be, we saw that—or it comes from the other spokes. They all connect at the top. With a few more valves, you can use the spokes against each other. Open and close a few, and you end up sucking air out of Oceanus, through the hub, and into this spoke. Then open and close some more, and force it down over Rhea. Now if I only knew why the builders thought it was necessary."

Gaby looked thoughtful.

"I think I can give you that. It's something that's bothered me. Why doesn't all the air pool at the bottom, down at the rim? The air's thinner up here, but it's still okay because the air pressure at the rim is higher than Earth-normal. And in low gravity, pressure drops off less quickly. Mars' atmosphere isn't much, for instance, but it goes out a long way. Then if you keep the air circulating, it doesn't have time to settle. You can keep adequate air pressure all the way through Gaea."

Cirocco nodded, then sighed.

"All right. You've just disposed of

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the last objection to the climb. We've got food and water, or at least it looks like we will. Now it looks like we'll have air, too. What do you say we get going?"

"How about exploring the rest of the wall?"

"What's the use? We might already have passed what we're looking for. There's just no way to see it."

"I guess you're right. Okay, lead on."

The climbing was hard work: tedious, and yet requiring full attention. They got better at it as they went along, but Cirocco knew it would never get as easy as the climb up the cable.

The one consolation at the end of the first ten-hour climb was that they were in shape. Cirocco was weary and there was a blister on her left palm, but aside from a slight backache she felt all right. It would be good to sleep. They climbed out to the top of a tree for a look down before making camp.

"Will your system measure a height like that?"

Gaby frowned, and shook her head.

"Not well." She held her hands out, made a square with them, and squinted. "I'd say—*yeow*!"

Cirocco grabbed her under one arm, steadying herself by holding a branch over her head.

"Thanks. What a fall that would have been."

"You had your rope," Cirocco pointed out.

"Yeah, but I don't really want to swing on the end of it." She caught her breath, then looked at the ground again.

"What can I say? It's a hell of a lot farther away than it was, and the ceiling ain't a meter closer. It's going to be that way for a long time."

"Would you say three kilometers is about right?"

"I will if you will."

That meant one hundred climbing days, assuming no trouble. Cirocco moaned softly and looked again, trying to believe it was five kilometers but suspecting it was closer to two.

They went back in and found two branches nearly parallel and two and a half meters apart. They slung their hammocks between them, sat on one branch and ate a cold meal of raw vegetables and fruit, then got into the hammocks and strapped themselves in.

Two hours later, it began to rain.

Cirocco woke to a steady dripping on her face, moved her head, and glanced at her watch. It was darker than it had been when she went to sleep. Gaby was snoring quietly, on her side, her face pressed into the webbing. She would have a sore neck in the morning. Cirocco debated waking her but decided that if she could sleep through the rain she was probably better off.

Before moving her hammock, Cirocco edged out to the top of the tree. She could see nothing but a dim wall of mist and a steady downpour. It was raining much harder toward the center. All they were getting at the camp-

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site was the water which gathered on the outer leaves and ran down the limbs.

When she returned Gaby was awake and the dripping was much worse. They decided moving the hammocks would do no good. They got out a tent and, after ripping a few seams with their knives, converted it to a canopy which they tied above the campsite. They dried as best they could and got back into the wet hammocks. The heat and humidity were terrible, but Cirocco was so tired she quickly fell asleep to the sound of water beating on the tarp.

They woke again, shivering, two hours later.

"One of those nights," Gaby groaned.

Cirocco's teeth chattered as they unpacked coats and blankets, wrapped themselves tightly, and returned to the hammocks. It was half an hour before she felt warm enough to sleep again.

The gentle swaying motion of the trees helped.

Cirocco sneezed, and snow fluttered away. It was very light, very dry snow, and it had drifted into every crevice of her blanket. She sat up, and it avalanched into her lap.

Icicles hung from the edges of the tarp and the ropes that suspended her hammock. There was a constant cracking sound as wind whipped branches up and down, and a constant clatter of ice hitting the frozen tarp. It was cold and raw, wintertime. One of her hands was exposed, and it was stiff and chapped as she reached across the gap and prodded Gaby.

"Huh? Huh?" Gaby looked around with one bleary eye, the other held shut by frozen lashes. "Oh, *damn*!" She was racked by coughs.

"Are you okay?"

"Except for a frozen ear, I guess so. What now?"

"Put on everything we have, I guess. Then wait it out."

It was hard to do, sitting in a hammock, but they managed it. There was one disaster as Cirocco fumbled with numb fingers, then saw a glove quickly vanish in the swirling snow beneath them. She cursed for five minutes before recalling they still had Gene's gloves.

Then they waited.

Sleep was impossible. They were warm enough in the layers of clothing and blankets, but they wished for face masks and goggles. Every ten minutes they shook the accumulation of snow from their bodies.

They tried to talk, but the spoke was alive with sound. Cirocco found the minutes stretching into hours as she reclined with the blanket over her face and listened to the wind howling. Over that sound, and much more frightening, was a sound like popping corn. Branches, overloaded with ice, were snapping off as the wind whipped them.

They waited five hours. If anything, the wind grew colder and stronger. A branch snapped near them, and Cirocco listened to it crash through the ice-

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crusted forest below.

"Gaby, can you hear me?"

"I hear you, Captain. What do we do now?"

"I hate to say it, but we're going to have to move. I want to be on thicker branches. I don't think these will break, but if one breaks above us, we've had it."

"I was just waiting for you to suggest it."

Getting out of the hammocks was a nightmare. Once out of them and standing on the tree limb, it was worse. Their safety ropes were frozen and had to be painstakingly bent and twisted before they could be used. When they began to work their way in, it was strictly one step at a time. They had to attach a second safety line before going back to remove the first, then repeat the process, tying knots with gloved hands or removing the gloves and doing it quickly before their fingers grew numb. They used hammers and picks to chip ice from branches they had to walk on. With all their caution, Cirocco fell twice and Gaby once. Cirocco's second fall resulted in a strained muscle in her back when the safety line stopped her.

After an hour of struggle they reached the main trunk. It was steady and wide enough to sit on. But the wind blew harder than ever with no branches to break its force.

They drove spikes into the tree, lashed themselves to it, and prepared once more to wait it out.

"I hate to bring this up, but I can't feel my toes."

Cirocco coughed for a long time before she could talk.

"What do you suggest?"

"I don't know," Gaby said. "I do know that we'll freeze to death if we don't do something. We've got to either keep moving, or look for shelter."

She was right, and Cirocco knew it.

"Up, or down?"

"There's the staircase at the bottom."

"It took us a day to get this high, with no ice to complicate things. And it's another two days back to the stairs."

"I was about to get to that."

"If we move, we might as well go up. Either way, we'll freeze unless this weather breaks soon. Moving would postpone that a while, I guess."

"That was my thought, too," Gaby said. "But I'd like to try something else, first. Let's go all the way to the wall. Remember earlier you talked about where the angels might live, and you mentioned caves. Maybe there're caves back there."

Cirocco knew the main thing was to become active again, to get the blood flowing. So they crawled along the tree trunk, chipping ice as they went. In fifteen minutes they reached the wall.

Gaby studied it, then braced herself and began attacking the ice with her pick. It fell away to expose the gray substance, but she did not stop chopping. When Cirocco saw what she

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was doing, she joined her with her own pick.

It went well for a while. They hacked a hole half a meter in diameter. The white milk froze as it oozed from the wall, and they chipped that away, too. Gaby was a demon of snow; it caked her clothes and the woolen scarf drawn over her mouth and nose, turned her eyebrows into thick white ledges.

Soon they reached a new layer that was too tough to cut. Gaby attacked it viciously, but eventually conceded she was getting nowhere. She let her hand drop to her side and glared at the wall.

"Well, it was an idea." She kicked disgustedly at the snow that had fallen around them as they worked, shaken down by the vibrations. She looked at it, then craned her neck and stared up into the darkness. She took a step back, grabbing Cirocco's arm to steady herself when she slipped on ice chips.

"There's a darker patch up there," she said, pointing. "Ten . . . no, fifteen meters up. Slightly to the right. See it?"

Cirocco was not sure. She could see several dark places, but none of them looked like a cave.

"I'm going up to take a look."

"Let me do it. You've been working harder."

Gaby shook her head. "I'm lighter than you are."

Cirocco did not argue, and Gaby hammered a spike into the wall as high as she could reach. She tied a rope to it and climbed high enough to hammer in a second spike. When it was secure, she knocked the first one loose and drove it in a meter above the second.

It took her an hour to reach the place. Cirocco shivered below, stamping her feet and shrugging off the showers of ice Gaby sent down around her. Then a dislodged shelf of snow broke over her shoulders and brought her to her knees.

"Sorry about that," Gaby called down. "But I've got something here. Let me get it cleared and you can come up."

The entrance was barely large enough for Cirocco to squeeze through, even after Gaby had chipped away most of the ice. Inside, it was a hollow bubble with a diameter of about a meter and a half, and a floor to ceiling height slightly less than that. Cirocco had to remove her pack, then pull it in after her. With both of them and two packs inside it seemed possible they might have found room to stow a shoebox and still be able to breathe, but not much more than that.

"Cozy, eh?" Gaby said, removing Cirocco's elbow from her neck.

"Sorry. Oh, sorry about that, too. Gaby, my foot!"

"Excuse me. If you'd just scrunch . . . that's better, but I wish you wouldn't stand there."

"Where? Oh, my." She suddenly burst out laughing. She was crouched with her back against the ceiling and her knees bent while Gaby edged to

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the rear and tried to stay out of the way.

"What's so funny?"

"I was thinking of an old movie. Laurel and Hardy in their nightgowns, trying to bed down in an upper berth."

Gaby was smiling, but obviously didn't know what she was talking about.

"An upper berth, you know, on a cross-country train . . . skip it. I just thought they should have tried it in arctic gear, and with a couple suitcases thrown in. How do you want to work this?"

They shoveled the remainder of the snow out of the tiny cave and stacked the gear in front of the opening to block it. When they did so, what little light there had been vanished, but the wind stopped blowing in, so they counted it a gain. After struggling for twenty minutes they managed to settle down side by side. Cirocco could barely move, but was not inclined to worry about such things in the blessed warmth.

"You think we can get some sleep now?" Gaby wondered.

"I sure feel like I could. How are your toes?"

"Okay. Tingling, but they're getting warm."

"Me, too. Good night, Gaby."

"I love you, Rocky."

"Go to sleep." She said it with a smile.

The next time Cirocco woke, sweat beaded her forehead. Her clothes were soaked. She lifted her head groggily and realized she could see. Wondering if the weather had changed, she moved her pack slightly, then more urgently, and discovered the entrance to the cave had closed.

She almost woke Gaby, but thought better of it just in time.

"Try to get out *first*," she muttered. There was no sense telling Gaby she had been eaten alive again unless it was really true. Gaby would not take the news well; the thought of being confined in such a small space—bad enough in itself—was terrifying when she thought of Gaby and her contagious panic.

It turned out there was no cause for alarm. While she explored the wall where the hole had been, it began to move, irising until it was as large as it had been before. There was a clear window of ice with faint light behind it. She hit it with her gloved fist and it shattered. Frigid air rushed in, and she hastily blocked the hole again with her pack.

In a few minutes she moved the pack. The hole had closed to a few centimeters.

She looked thoughtfully at the tiny hole, putting it all together in her mind. Only when she thought she understood it did she shake Gaby's shoulder.

"Wake up, kid, it's time to make adjustments again."

"Hmmm?" Gaby came awake quickly. "Hell, it's an oven in here."

"That's what I meant. We'll have to take off some clothes. You want to go

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first?"

"Go ahead. I'll try to stay out of your way."

"Right. Why do you suppose it's so hot in here? Have you thought about that?"

"I just woke up, Rocky. Have a heart."

"Okay. I'll tell you. Feel the walls." She performed the complex task of removing her parka while Gaby made the same discovery she had made earlier.

"It's warm."

"Yeah. I couldn't figure out this wall from the first. I thought the trees were unplanned-for, like the growths on the cable, but they couldn't grow here, as I see it, without the wall to nourish them. I tried to think what kind of machine would do that best, and I came back to a natural biochemical machine. An animal, or a plant, possibly a genetically tailored one. I find it hard to believe something like this could have evolved in any reasonable time. It's three hundred kilometers high, hollow in the middle, and hugs the *real* wall."

"And the trees are parasites?" Gaby was taking it better than Cirocco had expected.

"Only in the sense that they draw nourishment from another animal. But they're not true parasites, because it was *planned* that way. The builders designed this large animal as a habitat for the trees, and in turn the trees provide habitats for smaller animals, and probably for the angels."

Gaby considered it, and looked narrowly at Cirocco.

"Pretty much like the very large animals that we presume live below the rim," she said, quietly.

"Yes, something like that." She watched Gaby for signs of panic, but did not even see her breathing heavily. "Does that . . . ah . . . worry you?"

"You mean my well-known phobia?"

Cirocco reached behind her pack and stimulated the entrance into opening again, then moved the pack and let Gaby see it. It began to close slowly.

"I found this before I woke you up. See, it's closing, but it'll open again if you tickle it. We're *not* trapped, and this isn't a stomach or anything like—"

Gaby touched her hand, smiling faintly. "I appreciate your concern."

"Well, I didn't mean to embarrass you, I only . . ."

"You did the right thing. If I'd seen that first I'd probably still be screaming. But I'm not basically claustrophobic. I've got a new phobia that may be my very own; fear of being eaten alive. But tell me—and make it very convincing, please—if this isn't a stomach, what is it?"

"There's no parallel on any creature I know." She was down to her last layer of clothing now, and decided to stop there. "It's a refuge," she went on, trying to make herself small as Gaby began to remove her clothes. "It's for precisely what we're using it for: a place to get in out of the cold. I'm willing to bet the angels winter in caves like this. Maybe other animals,

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too. Possibly the creature gets something out of it. Maybe the droppings fertilize it."

The ice formed around the entrance as fast as they could knock it away.

They worried about air at first, but a few experiments proved there would be adequate oxygen even with the opening completely closed. The only explanation was that the survival capsule functioned like a plant, soaking up carbon dioxide through its inner walls.

They discovered a nipple set into the back of the cave. When squeezed, it exuded the same milky substance they had seen earlier. They tasted it, but decided to stick to their supplies until there was nothing left. This was the milk of Gaea, Meistersinger had told Cirocco about. Undoubtedly it fed the angels.

The hours slowly turned into days, the chess games into tournaments. Gaby won most of them. They invented new games with words and numbers, and Gaby won most of those, too.

For five days the wind howled outside. On the sixth, the thaw began, and lasted until the seventh day.

It was dangerous to go out during the thaw. Chunks of ice came crashing down from above, making a terrible racket. When it stopped, they emerged, blinking, into a world that was cool, and shining with water, and whispering to them.

They worked their way out to the top of the nearest tree, heard the whispering grow louder. As the smaller branches began to bend beneath their weight, they entered a gentle rain: big drops falling in slow motion from leaf to leaf.

The air in the center of the column was clear, but all around them, as far as they could see, the walls were wreathed in rainbows as the melted ice worked its way down through the foliage to the new lake on the spoke floor.

"What now?" Gaby asked.

"In. In, and up. We've lost a lot of time."

Gaby nodded. "I don't mind, you know that, as long as it's where you're going. But would you tell me once more—why?"

Cirocco was about to say it was a stupid question, but realized it was not. She had admitted to Gaby during their long incarceration that she no longer believed she would find anyone in control at the hub. She did not know herself when she had stopped believing it.

"I made a promise to Meistersinger," she said. "And now I have no further secrets from you. Not one."

Gaby frowned. "A promise to do what?"

"To see if there is anything I can do to stop the war between the titanides and the angels. I didn't tell anyone about it. I'm not sure why."

"I see. Do you think there's anything you *can* do?"

"No." Gaby said nothing, but continued to search her eyes. "I have to

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give it a try. Why are you looking at me like that?"

Gaby shrugged. "No reason. I'll just be curious to know your reasons for going on after we find the angels. We *will* be going on, won't we?"

"I suppose so. Somehow it seems like the right thing to do."

CHAPTER NINETEEN

The world was an endless series of trees to climb. Each was a variation on the same problem; as different as snowflakes, yet with a numbing sameness. What communication was needed to get through them could be accomplished by hand motions and grunts. They became a perfect tree-climbing machine, one body moving forever upward. They climbed for twelve hours at a stretch. When they camped, they slept like the dead.

Below them, the floor opened and a sea of water fell over Rhea. It remained open for a few weeks, then closed when the roof opened and the frigid winds blew once more, forcing them to take shelter. Five days of darkness and they were out again, and climbing.

They were six days past their third winter when they saw their first angel. They stopped climbing, and watched him watching them.

He was near the top of the tree, indistinct through the branches. They had heard angels wailing before, sometimes followed by the sound of giant wings flapping. Still, so far, Cirocco's knowledge of angels was limited to one frozen moment when she had seen one impaled on a titanide spear.

He was smaller than Gaby, with a huge chest and spindly arms and legs. He had claws instead of feet. His wings emerged just above his hips so that in flight he would be prone with the same amount of weight on each side of the wings. Folded, they reached over his head with the tips trailing below the branch he perched on. The flight surfaces on his legs, arms, and tail were neatly folded.

Having noted all those differences, Cirocco had to admit that the most startling thing about him was his humanness. He looked like a child dying of malnutrition, but it was a human child.

Gaby glanced at Cirocco, who shrugged, then motioned for her to be ready for anything. She took a step forward.

The angel shrieked and danced backward. His wings unfolded to their full nine-meter span and he poised, beating them lazily to remain on branches too thin to hold his weight.

"We'd just like to talk to you." She held out her hands. The angel shrieked again, and was gone. They could hear the roaring of his wings as he gained altitude.

Gaby looked at Cirocco. She raised one eyebrow and made a motion with one hand, questioningly.

"Right. Up."

"Captain."

Cirocco froze instantly. Ahead, Gaby was jerked to a stop as the rope

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between them grew taut.

"What?" Gaby asked.

"Quiet. Listen."

They waited, and in a few minutes the call came again. This time, Gaby heard it, too.

"April."

"Right," came the reply, though Cirocco had not said the name very loudly. "Talk?"

"Of course I want to talk. Where the hell are you."

"Below. I see you. Don't come back."

"Why not? Dammit, April, we've been hoping you'd turn up for months. August has been going crazy." Cirocco was frowning. Something was wrong, and she wanted to know what it was.

"I come to you, or not at all. You come to me, I fly away."

She perched in the small branches, twenty meters from the two women. Even at that distance Cirocco could make out her face, exactly like August's. She was an angel, and Cirocco was sick.

She seemed to have trouble speaking. There were long pauses between sentences.

"Please do not come closer. Do not move in my direction. We can talk this way for only a short time."

"Surely you don't think we'll hurt you?"

"And why not? I . . ." She stopped, edging away. "No, I suppose not. But I could no more let you approach than I could hold my hand in a fire. You smell wrong."

"Does it have to do with the titanides?"

"With what?"

"The centaurs. The people you make war with."

She hissed and backed away. "Do not speak of them."

"I don't think I can avoid it."

"Then I must leave. I will try to return." With a loud cry, she plunged through the leaves. They heard her wings for a short time, then it was as if she had never been with them.

Cirocco looked at Gaby, who sat with her feet dangling. Her face was somber.

"It's awful," Cirocco whispered. "What happened to us?"

"I was hoping she could give us some answers. Whatever it was, it hit her the worst."

She returned a few hours later but could not answer the questions that mattered most. It appeared she had not even been thinking about them.

"How should I know?" she said. "I was in the darkness, the world-being pushed me into light, I woke up, and I was as you see me. It didn't matter, and it doesn't matter now."

"Can you explain that?"

"I'm happy. No one wanted me or my sister. No one loved us. Well, now I don't need it. I am of the Eagle clan, proud and alone."

Cautious questioning brought out what it meant to be of the Eagle clan. It was not a tribe or association, as April had seemed to imply; rather, it

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was a species within the genus Angel.

Eagles were loners, solitary from birth to death.

"There is something I don't understand," Cirocco said, carefully. "May I ask?"

"I don't promise to answer."

"You referred to the 'world-being.' Are you talking about this thing in the spoke?"

April looked surprised. "Why, no. This is only a part of her. The whole world is alive. Gaea is the world. I thought you knew that."

"No, I—wait, please don't go." It was too late. They heard the beating of her wings. "Will you come back later?" Cirocco shouted.

"Once more," came the distant reply.

"One being, you say. All one creature. How do you know this?"

April had returned in only an hour this time. Cirocco hoped she was getting used to company again, but she still would approach no closer than twenty meters.

"Believe it. Some of my people have talked with her."

"She's intelligent, then?"

"Why not? Listen . . . Captain." She held her temples for a moment. Cirocco could imagine the conflicts. April had been one of the finest physicists in the system. Now she lived as a fierce wild animal, according to a code barely comprehensible to Cirocco. She thought the old April might be struggling to get through the creature she had become.

"Cirocco, you say you speak to . . . to those on the rim." It was as close as she could come to the concept of titantides without fleeing. "They understand you. Calvin can speak to the floaters. The changes Gaea worked on me are more complete. I *am* one of my people. I awoke knowing how to behave among them. I have the same feelings and drives as any other angel. This is one thing I know. Gaea is one. Gaea is alive. We live inside her."

Gaby was looking a bit green.

"Just look around you," April went on. "What have you seen that looks like a machine? Anything at all? We were seized by a living beast; you postulate a creature under the rim. The spoke is filled with a huge living thing; you decide it is a coating over the framework beneath."

"What you say is intriguing."

"More than that. It's true."

"If I accept that, I won't find a control room in the hub."

"But you'll be where she lives. She sits like a spider and pulls strings like a puppet master. She watches over all her creatures, and she owns the two of you as surely as she owns me. She has tampered with us for her own purposes."

"And what are they?"

April shrugged, a human gesture that hurt Cirocco to watch.

"She would not tell me. I went to the hub, but she refused to see me. My people say that one must be on a great mission to gain Gaea's ear. Apparently mine was not great enough."

"And what would you have asked

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her if you'd had the chance?"

April was quiet for a very long time. Cirocco realized she was crying. She looked up at them again.

"You hurt me. I think I won't talk to you any more."

"Please, April. Please, for the friendship we had."

"Did we? Did we really? I can't remember it. I remember only me and August, and long ago, my other sisters. We have always been alone with each other. Now I am alone, alone."

"Do you miss them?"

"I did," she said, emptily. "That was long ago. I fly, fly to be alone. Solitude is the world of the Eagle clan. I know that is right, but before . . . before, when I still yearned for my sisters . . ."

Cirocco held very still, afraid of frightening her away.

"We band together only at one time," she said, with a quiet sigh. "When Gaea takes her breath, after the winter, then blows us over the lands . . .

"I flew with the wing that day. It was a fine day. We killed many because my people listened to me and rode the great floater. The four-legs were surprised because the breath was over; we few had remained on the floater, tired and hungry, but with the lust still in our blood, still able to work together.

"It was a day for the singing of great songs. My people followed me—me!—did what I told them, and I knew in my heart that the four-legs would soon be wiped out in Gaea. This was but the first skirmish in the new war.

"Then I saw August and my mind left me. I wanted to kill her, I wanted to fly from her, I wanted to embrace her and weep with her.

"I flew.

"Now I dread the breath of Gaea, for someday it will take me down to slaughter my sister, and then I will die. I am Ariel the Swift, but enough of April Polo remains in me that I could not live with such a thing."

Cirocco was moved, but could not help being excited. April sounded as if she was important in the angel community. Surely they would listen to her.

"It happens that I am up to make peace," she said. "Don't go! Please don't go."

April trembled, but stood her ground. "Peace is impossible."

"I can't believe that. Many of the titanides are sick in their hearts, as you are."

April shook her head. "Does a lamb negotiate with a lion? A bat with an insect, a bird with a worm?"

"You're talking about predators and prey."

"Natural enemies. It's printed in our genes, killing the four-legs. I can . . . as April, I can see what you're thinking. Peace should be possible. We have to fly impossible distances just to do battle. Many of us do not make it back. The climb is too hard, and we fall into the sea."

Cirocco shook her head. "I just think if I could get some representa-

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tives together . . ."

"I tell you, it's impossible. We are Eagles. You cannot even get us to act as a group, much less meet with the four-legs. There are other clans, some of them sociable, but they don't live in this spoke. Perhaps you would have luck there, but I doubt it."

The three of them were silent for a time. Cirocco felt heavy with defeat, and Gaby put her hand on her shoulder.

"What do you think? Is she telling the truth?"

"I suspect she is. It sounds just like what Meistersinger told me. They have no control over it." She looked up, and spoke to April.

"You were saying that you tried to see Gaea. Why?"

"For peace. I wanted to ask her why the war had to be. I'm quite happy, but for that. She did not hear my call."

Or she doesn't exist, Cirocco thought.

"Will you still go seek her?" April asked.

"I don't know. What's the point? Why would this superhuman being stop a war just because I ask her to?"

"There are worse things to do in life than to have a quest to fulfill. If you turned back now, what would you do?"

"I don't know that, either."

"You've come a long way. You must have overcome great difficulties. My people say Gaea likes a good story, and she likes great heroes. Are you a hero?"

She thought of Panpipe running to his doom, of the mudfish bearing down on her. Surely a hero would have done better than that.

"She is," Gaby said, suddenly. "Of all of us, only Rocky has held to her purpose. We'd still be sitting in mud shacks if she hadn't pushed us. She kept us moving toward a goal. We may not reach it, but when that rescue ship comes, I'll bet they find us still trying."

Cirocco was embarrassed, but strangely moved. She had been fighting a sense of failure since the capture; it didn't hurt to know someone thought she was doing well. But a hero? No, not hardly. She had only done what had to be done.

"I think Gaea will be impressed," April said. "Go to her. Stand in her hub and shout. Do not grovel or beg. Tell her you have a right to some answers, for all of us. She will listen."

"Come with us, April."

The angel-woman edged away.

"My name is Ariel the Swift. I go with no one, and no one goes with me. I will never see you again." She dived once more, and Cirocco knew she would keep her word.

She looked at Gaby, who rolled her eyes upward with a slight twist of her mouth.

"Up?"

"Why the hell not? There *are* a few things I'd like to ask."

CHAPTER TWENTY

"I'm not a hero, you know."

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"All right, heroine."

Cirocco chuckled. They were bedded down on the last day of their fourteenth winter together, their eighth month in the spoke. There were now only ten kilometers separating them from the hub. They could do it in their sleep, as soon as the thaw started.

"Not even that. If there's a heroine here, it has to be you."

Gaby shook her head.

"I've helped out. This probably would have been a lot harder for you if I hadn't been here."

Cirocco squeezed her hand.

"But I've just tagged along. I've helped you out of some messes, but I don't qualify as a hero. *You* would have made it here by yourself. I wouldn't have."

They were silent, each with her own thoughts.

Cirocco was not sure what Gaby said was true. Part of it was accurate, though she would never agree with it out loud. Gaby could not have brought them this far. She was not a leader.

But am I? she wondered. She had certainly tried hard enough to be one. Could she have made it alone? She doubted it.

"It's been fun, hasn't it?" Gaby said, quietly.

Cirocco was genuinely surprised. Was it possible to call eight month's struggle fun?

"I don't think that's the word I would have used."

"No, you're right. But you know what I mean."

Oddly enough, she did. She was at last able to understand the depression that had plagued her during the last weeks. The trip would soon be over. They would discover the means to return to Earth, or they would not.

"I don't want to go back to Earth," Cirocco said.

"Me either."

"But we can't just turn back."

"You know best."

"No, I'm just stubborn. But we do have to go on. I owe it to April—and the rest of us, too—to find out what's been done to us, and why."

"Get out those swords, will you?"

"You expecting trouble?"

"Nothing that a sword would cure. I'd just feel better with it in my hand. I'm supposed to be a hero, right?"

Gaby didn't argue. She went down on one knee and rummaged through the extra pack, came up with the short swords and tossed one to Cirocco.

They were standing near the top of what had to be the last staircase. Like the one they had climbed at the bottom of the spoke, it made a spiral around the cable, which they had rediscovered at the top of a long, bare incline that marked the margin between the forest and the upper spoke valve. Climbing the slope had been pick, rope, and piton work, occupying them for two arduous days.

With no lamp oil remaining, the climb up the stairs had been done in total darkness, one step at a time. It had passed without incident until Cirocco had discerned a faint, red glow in front of them. Suddenly she had felt

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the need of a sword in her hand.

It was a fine weapon, though the hilt was too large. It weighed nothing at all this high in Gaea. She struck a match and touched the figure of a titanide chased into the flat of the blade.

She looked down at herself. She was ragged, wrapped in the tatters of her fine clothing. Her skin was pale where it was clean enough to see. She had lost weight; what was left was hard and wiry. Her feet and hands were tough as leather.

She shook the match out and lit another. Gaby was looking at her. Her eyes glowed in the yellow light. Cirocco suddenly felt very good. She smiled, then laughed quietly, reached out and put her hand on Gaby's shoulder. Gaby returned the gesture, a half-smile on her face.

"Do you . . . have some kind of feeling about this?" Gaby gestured with her sword toward the top of the stairs.

"Maybe I do." She laughed again, and then shrugged. "Nothing specific. We ought to be on our toes."

Gaby said nothing, but wiped her palm on her thigh before settling her fingers firmly around her sword hilt. Then she laughed.

"I don't know how to use this."

"Just act as if you do. When we get to the top of the stairs, leave all the gear behind."

"You sure?"

"I don't want the extra mass."

"The hub's a big place, Rocky. It might take a while to search it."

"I've got a feeling it won't be long. Not long at all."

She blew out the second match. They waited until their eyes had adjusted, until they could see the faint glow from above. Then they walked, side by side, up the last hundred steps.

They ascended into a pulsing red night.

The only light came from a laser-straight line overhead. The ceiling was lost in gloom. To their left, a cable loomed, a black shadow in the blacker air.

The walls, the floor, and the air itself reverberated with the rhythm of a slow heartbeat. They faced into a cold, thin wind, blowing from the unseen entrance to the Oceanus spoke.

"It's going to be tough to nose around," Gaby whispered. "I can only see about twenty meters of floor."

Cirocco said nothing. She shook her head to clear the odd, heavy feeling that had come over her, then fought off an attack of dizziness. She wanted to sit down, she wanted to turn back. She was afraid, and did not dare give in to it.

She held up her sword and saw it shimmer like a pool of blood. She took one step forward, then another. Gaby kept pace, and they walked into the darkness.

Her teeth hurt. She realized she had been biting down hard, jaw muscles knotted. She stopped, and shouted.

"I'm here!"

After long seconds an echo re-

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turned, then a series of them trailing into oblivion.

She held her sword above her head and shouted again.

"I'm here! I am Captain Cirocco Jones, commander of the *DSV Ringmaster*, commissioned by the United States of America, the National Aeronautics and Space Administration, and the United Nations of Earth. I would like to speak with you!"

It seemed like ages before the echoes died away. When they were gone, there was nothing but the slow pulsing of the monstrous heart. They stood back to back, swords ready, looking into the darkness.

Cirocco felt a surge of anger flow through her, erasing the last traces of fear. She brandished her sword and screamed into the night as tears ran down her cheeks.

"I *demand* to see you! My friend and I have come through many hardships to stand here before you. The ground coughed us forth naked into this world. We have fought our way to the top of it. We have been treated cruelly, tossed about at whims we do not understand. Your hand has reached into our souls and tried to take our dignity, and we remain unbowed. I challenge you to come forth and answer to me! Answer for what you have done, or I will devote my life to destroying you utterly. I do not fear you! I am ready to fight!"

She had no idea how long Gaby had been tugging her sleeve. She looked down, having trouble focusing. Gaby looked frightened, but still staunchly at her side.

"Maybe," she said, timidly, "uh, maybe she doesn't speak English."

So Cirocco sang her challenge again in Titanide. She used the high declamatory mode, the one reserved for the telling of tales. The hard, dark walls threw her song back until the black hub rang with her defiant music.

The floor began to shake.

"IIIIIIIII . . ."

It was a single note, an English word, a hurricane of speech.

"Heeeeeeeear . . ."

Cirocco fell to her hands and knees, looking dumbly at Gaby hugging the floor beside her.

"Yooooooooouu . . ."

The word echoed for many minutes, gradually trailing into the far-off bass muttering of an air-raid siren winding down. The floor steadied, and Cirocco lifted her head.

White light blinded her.

Shielding her eyes with her forearm, she squinted into the glare. A curtain was being drawn from one of the walls. The curtain reached from the floor to the ceiling, five kilometers high. Behind it was a crystal staircase. It sparkled cruelly as it ascended into light so intense Cirocco could not look at it.

Gaby was tugging at her sleeve again.

"Let's get out of here," she whispered, urgently.

"No. I came to talk to her."

She forced herself to put her palms flat to the floor and push herself up. Getting to her feet was easy; staying

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there was another matter. She would have liked nothing better than to do as Gaby suggested. Her bravado now seemed like a fit of intoxication.

But she began to walk toward the light.

The opening was two hundred meters wide, flanked by crystalline columns that had to be the upper ends of support cables. Looking up, she could see them unwind, each strand twisting through a complex pattern until it joined a basket-weave that covered the distant roof. Here was the unimaginably strong anchor that held Gaea together.

She frowned. One of the strands was broken. Upon closer examination, the whole ceiling looked like a sweater a kitten had played with, full of snarls and ravels.

It made her feel better to look at it. Mighty as Gaea was, she had seen better days.

They reached the bottom riser of the staircase and stepped onto it. It emitted a low organ note that lingered while they climbed. The seventh step raised the pitch one half tone, and the thirteenth step sharped it again. They proceeded slowly through the chromatic scale, and when the first octave was reached, harmonics began to creep in.

With no warning, orange flames roared on each side of them. The women literally jumped two meters into the air before the low gravity brought them to a stop.

Finally, gratefully, Cirocco began to get angry again. Awesome it was—a knee-knocking, teeth-chattering display of raw power that was sure to make the bravest grovel. Yet it had the opposite effect on Cirocco. God or no god, it had been a cheap trick, calculated to play on nerves already scraped raw. As such, she thought it in the same league with the novelty palm buzzer.

"P.T. Barnum had nothing on this girl," Gaby said, and Cirocco loved her for it. Showmanship, that's what it was. What kind of a god would need it?

The flames died, only to leap twice as high, licking the ceiling to make a tunnel of yellow and orange. They kept walking.

Ahead were towering gates of copper and gold. They swung open without a sound and clanged shut behind them.

The music rose to a maddened crescendo as they approached a large throne surrounded in light. By the time they reached the broad, marble platform at the top of the stairs it was impossible to face the throne. The heat was too intense.

"Speak."

As the word was uttered—in the same deep tones they had heard outside, and yet with a more human sound—the light began to dim. Cirocco stole cautious glances, made out a tall, wide, human shape in the fog of light.

"Speak, or return from whence you came."

Cirocco squinted, saw a round head set on a thick neck, eyes that blazed

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like coals, thick lips. Gaea was four meters tall, standing erect before her throne on a two-meter pedestal. Her body was round with a monstrous belly, huge breasts, arms and legs that would have awed a professional wrestler. She was naked, and the color of green olives.

The pedestal changed shape abruptly, became a grassy hill covered with flowers. Gaea's legs became tree stumps, her feet firmly rooted in the dark soil. Small animals stood around her while flying creatures circled her head. She looked directly at Cirocco, and her huge brow began to cloud.

"Uh . . . I mean, I'll speak, I'll speak." She opened her mouth to do so, wondering where her righteous anger had gone, when she glanced at Gaby. She was trembling, looking up at Gaea with eyes that glittered.

"I was here," she whispered. "I was here."

"Hush," Cirocco hissed, jabbing her with an elbow. "We'll talk about it *later*." She wiped sweat from her brow, and faced Gaea again.

"Oh Great—" No! Don't grovel, April said. She likes heroes, April said. Please, April, please be right.

"We came . . . uh, me and six others came from . . . we came from the planet Earth, quite some . . . I don't really know how long . . ." She stopped, and knew she would never get anything out in English. She took a deep breath, straightened her shoulders, and began to sing.

"We came in peace, I know not how long ago. We were a tiny crew, by your reckoning, and presented no threat to you. We were unarmed. And yet we were attacked. Our ship was destroyed before we had a chance to explain our intentions. We were confined against our will, in conditions injurious to our minds, unable to communicate with each other or our comrades on Earth. Changes were made in us. One of my crew was near to insanity at the time I left her. Another no longer desires the company of his fellow humans, and a third has lost much of his memory. Yet another has been changed beyond all recognition; she no longer knows her sister, who she once loved.

"All these things are monstrous to us. I feel we have been wronged, and deserve an explanation. We have been treated badly, and deserve justice."

She sagged a little, happy to have gotten it all out. What happened next was out of her hands. She was through kidding herself; she could not fight this thing.

Gaea's frown deepened.

"I am not a signatory of the Geneva Accords."

Cirocco's mouth fell open. She didn't know what she had expected to hear, but it certainly wasn't that.

"What *are* you then?" It came out before she could stop it.

"I am Gaea, the great and wise. I am the world, I am the truth, I am the law, I am—"

"You're the whole planet, then? April was telling the truth?"

Maybe it wasn't wise to interrupt a goddess, but Cirocco was feeling like

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Oliver Twist asking for more gruel. She had to fight it somehow.

"I wasn't through," Gaea rumbled. "But yes, I am. I am the Earth Mother, though I am not of your Earth. All life springs from me. I am one of a pantheon that reaches to the stars. Call me a Titan."

"Then it was you that—"

"Enough. I listen only to heroes. You spoke of great deeds when you sang your song. Speak of them now, or leave me forever. Sing to me of your adventures."

"But I—"

"Sing to me!" Gaea thundered.

She sang. The story took several hours because, though Cirocco wanted to condense it, Gaea insisted on detail. Cirocco began warming to the task. The titanide language was well-suited to it; as long as she stayed in declamatory mode it was impossible to sing an awkward phrase. By the time she was finished she was feeling proud, and a bit more confident.

Gaea seemed to be pondering it. Cirocco shifted nervously. Her feet hurt, which proves, she thought, that you can get bored by anything.

At last Gaea spoke again.

"It was a good tale," she said. "Better than I have heard in many an age. You are truly heroic. I will speak with you both in my chambers."

With that, she vanished. There was only a flame which flickered for a few minutes, then died away.

They looked around them. They were in a large domed room. Behind them the stairs, unlighted now, reached down to the dark hub interior. Corroded nozzles lined the staircase, smoking fitfully, giving off the sharp pings of cooling metal. The smell of burnt rubber hung in the air.

The marble floor was cracked and discolored, covered with a film of dust that clearly showed their footprints. The place looked like a seedy opera house when the house lights come up and banish illusion.

"I've seen some screwy things since we got here," Gaby said, "but this takes it. Where do we go now?"

Cirocco pointed silently to a small door set into the wall on their left. It was ajar, and light was shining through the crack.

Cirocco pushed it open, looked around with a growing sense of recognition, then stepped in.

They entered a large room with a four-meter ceiling. The floor was composed of milky glass rectangles. Light shone through from below. The walls were paneled in beige painted wood and hung with gilt-framed oil paintings. The furnishings were Louis XVI.

"*Déjà vu,* eh?" said a voice from the far end of the room. It was a short, dumpy woman in a shapeless sack dress. She looked like Gaea in the same way a carved bar of soap might resemble Michelangelo's *Pieta.*

"Sit down, sit down," she said, jovially. "We don't stand on ceremony in here. You've seen the razzle-dazzle; here's the bitter reality.

"Can I get you something to drink?"

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CHAPTER TWENTY-ONE

Cirocco had given up on having opinions.

"You know what?" she said, feeling more than a little giddy. "If somebody said right now that *Ringmaster* has never left Earth orbit, that this whole thing had been staged in a Hollywood backlot, I don't think I'd bat an eye."

"A perfectly natural reaction," Gaea soothed.

She was waddling around the room, getting a glass of wine for Gaby and a double shot of Scotch on the rocks for Cirocco, straightening paintings, brushing dust from tables with the ragged hem of her skirt.

Gaea was short and squat, built like a barrel. Her skin was weathered and brown. She had a nose like a potato. But there were laugh lines at the corners of her eyes and her sensuous mouth.

Cirocco tried to place the face, giving her mind something to do while she studiously avoided making theories. W.C. Fields? No, only the nose qualified for the role.

Gaby and Cirocco sat on opposite ends of a slightly frayed couch. Gaea put a glass on the end table beside each of them, then huffed across the room to hoist her bulk into a high-backed chair. She wheezed, and laced her fingers in her lap.

"Ask me anything," she said, and leaned forward expectantly.

Cirocco and Gaby looked at each other, then back at Gaea. There was a short silence.

"You speak English," Cirocco said.

"That's not a question."

"*How* do you speak English? Where did you learn it?"

"I watch television."

Cirocco knew what she wanted to ask next, but didn't know if she should. Suppose this creature was the last remnant of the builders of Gaea? She had seen no proof that Gaea was actually one organism, as April had said it was, but it was possible this person *thought* she was a Goddess.

"What about all that . . . that show outside?" Gaby asked.

Gaea dismissed it with a wave.

"All done with mirrors, dear. Mere sleight-of-hand." She glanced at her lap, then looked sheepish. "I wanted to scare you off if you weren't real hero material. I gave it my best shot. I thought at this stage it would be easier for us to relate in here. Comfortable surroundings, food and drink—would you like something to eat? Coffee? Cocaine?"

"No, I'd . . . did you say . . ."

"Did you say coffee?"

". . . cocaine?"

Cirocco's nose was tingling, but she felt more alert and less afraid than she had since they entered the hub. She settled back on the couch and looked into the eyes of the creature who called herself Gaea.

"Mirrors, you said. What *are* you, then?"

Gaea's smile broadened.

"To the heart of the matter, eh? Good. I like directness." She pursed her lips and seemed to consider the

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question.

"Do you mean what is *this*, or what am I?" She put her hands just above her enormous breasts, then didn't wait for an answer. "I am three kinds of life. There is my body itself, which is the environment you have been moving through. There are my creatures, such as titanides, who belong to me but are not *controlled* by me. And there are my tools, separate from me, but part of me. I have certain powers of the mind—which were helpful in the illusions you just saw, incidentally. Call it hypnotism and telepathy, though it is neither.

"I am able to construct creatures that are extensions of my will. This one is eighty years old, the only one of her kind. I also have other sorts. They built this room and the stairway outside, mostly from plans I stole from movies."

"Yes, but getting—"

"I know, I know," Gaea soothed. "I wander. This is a damn nuisance, you see. I *have* to talk to you this way. When I said, 'I hear you' earlier . . . well, I was using the upper Oceanus valve as a larynx, forcing air from the spoke. It plays hell with the weather: those three words sent snow all over Hyperion.

"But letting you see this body makes you want to believe something else. Namely, that I'm a dizzy old woman, all alone up here."

She looked narrowly at Cirocco.

"You still suspect that, don't you?"

"I . . . I don't know what to think. Even if I believe you, I still don't know what you are."

"I am a Titan. You want to know what a Titan is." She leaned back in her chair and her gaze became distant.

"What I really am is lost in the past.

"We are old, that much is clear. We were constructed, not evolved. We live for three million years, and have been around for over a thousand of our generations. In that time we have changed, though not through evolutionary processes as you understand them.

"Much of our history is lost now. We do not know what race built us, nor for what purpose. Suffice it to say that our creators built well. They are gone, but we are still here. Perhaps their descendants still live within me, but if so, they have forgotten their former greatness. I listen to messages from my sisters spread through this galaxy, and no one speaks of the builders."

She closed her eyes for a moment, then opened them again, waiting.

"All right," Cirocco said. "You left out a lot of details. How did you get here? Why is there only one of you? You listen to the radio; do you talk over it, too? And if so, why haven't you contacted the Earth before this? If—"

Gaea held up a hand and chuckled.

"One at a time, please. You're making a lot of assumptions.

"What makes you think I'm a visi-

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tor? I was born in this system, just like you. My home is Rhea. On Iapetus my daughter is at this moment approaching maturity. There is a family of Titans circling Uranus. They make up the invisible rings. They're all smaller than me; I'm the largest Titan in this neighborhood."

"Iapetus?" Gaby said. "One of the reasons we—"

"Rest easy; I shall explain, and save you a trip.

"We can*not* travel between the stars. We can't move at all except for minor orbital adjustment.

"I release eggs from my rim, where they already have a respectable velocity because of my rotation. I aim them as best I can but over these distances hitting the target is problematic, since the eggs have no guidance once launched.

"When they fall on a suitable world—Iapetus is perfect: no air, rocky, plenty of sunlight, not too large and not too small—they take root. In fifty thousand years the infant Titan is ready to be born. At that stage, she has covered an entire hemisphere of the birthing body. That's how Iapetus looked seventy-five years ago; one side was significantly brighter than the other.

"The Titan infant then contracts until she is a thick band that circles the world from pole to pole. That is what Iapetus has become . . . My daughter has delved deep. She has reached to the core to find the elements she needs for viability. I'm afraid that Iapetus has been quite looted by now; my grandmother, and her mother before her, all used that one moon.

"My daughter is engaged in synthesizing the fuels she will need to break free of Iapetus. That should happen in five or six years. When she is ready—and not a day before, because once born she will contain all the mass she will ever have—she will blast herself into space. It's likely that Iapetus will split in the process, like the one that eventually became the Rings. Then—"

"You're saying Titans are responsible for the Rings?" Gaby asked.

"Didn't I just state it?" Gaea looked a bit annoyed, but was quite absorbed in her story.

"That was long ago, and you can't hold me responsible. At any rate, once free my daughter will kill her present rotation and begin to spin as I do. The part of her that will become her hub is presently touching the surface of Iapetus. In space, this will contract, pulling the spokes out behind it. She will spin faster, stabilizing, fill herself with air, begin moving mountains inside her to prepare for the creatures that will . . . well, you get the picture. I ramble when talking of my daughter, like any parent, I suppose."

"No, no, I'm fascinated," Cirocco said. "Your daughter will have titanides and angels and blimps inside her?"

Gaea chuckled.

"Not titanides, I suspect. If she fancies them she'll have to invent them herself, like I did."

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Cirocco shook her head. "You've left me behind."

"Simple enough. Most of my species are descendants of creatures Titans sheltered when we were created. Each egg I release contains the seeds of a million species, such as the electronic plants. I don't think my builders cared much for machines. They grew everything they needed, from clothing to houses to circuitry.

"The titanides and angels are different. You wondered, before you got used to them, how it was possible for them to look so human. The answer is simple. I used humans as a model. Titanides were easy, but angels . . . the headaches! Your storytellers were much more fanciful than practical. The wingspread had to be tremendous to get them off the ground, even with my low gravity and high air pressure. I'll admit they don't look like the Biblical model, but they work! The basic problem, you see, was—"

"You made them yourself," Cirocco said. "Everything about them, from scratch."

"I just said that, didn't I? I designed the DNA. It's no more difficult for me than making a clay model is for you."

"Everything about them is your design. And you got the basic ideas over the radio, which means they couldn't be very old as a culture. We haven't been broadcasting very long, by your standards."

"Less than a century, for the titanides. The angels are younger."

"Then . . . then you are a god. I don't want to get theological here, but I think you know what I mean."

"For all practical purposes, here in my little corner of the universe . . . yes, I am." She folded her hands and looked smug.

Cirocco looked longingly at the door. It would be so nice to go through it and try to forget this ever happened.

What did it matter if this person was an insane survivor of the builders? Cirocco asked herself. She had control of the world they called Gaea. It made no difference if she was in fact identical to it; she was the ultimate power, either way.

And oddly enough, Cirocco found herself liking her in her unguarded moments, until she recalled what had brought her to the hub in the first place.

"There are two things I want to ask you," Cirocco said, as firmly as she dared.

Gaea sat up alertly.

"Please go ahead. There happen to be two things I want to ask you, as well."

"I . . . you? Ask *me*?" The idea was completely unexpected. Cirocco was nervous enough at the idea of bringing up *Ringmaster*. She knew she and her crew had been wronged, but how do you say that to a goddess? Cirocco wished she had even a thousandth of the bravado that had enabled her to stand in the hub and shout

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curses to the empty air. "What could I possibly do for you?"

Gaea smiled.

"You might be surprised."

Cirocco glanced at Gaby, who widened her eyes slightly and surreptitiously crossed her fingers.

"The first . . . ah, the first concerns the titanides." Damn it, that was supposed to be number two. But it wouldn't hurt to test the water.

"A titanide called Meistersinger . . ." She sang his name, then went on. "He asked me to . . . if I ever got so far as to see you, to ask why they must be at war."

Gaea frowned, but in confusion more than anger.

"Surely you have deduced that."

"Well, yes, I did. Aggression against angels is built into them. It's an instinct, and the reverse is true for the angels."

"That's precisely correct."

"And since you designed them, you must have had a reason . . ."

Gaea looked surprised.

"Well, of course. I wanted to have a war. I'd never heard of them until I began watching your television programs. You people seemed to like them so much, holding one every few years, that I thought I'd give it a try."

Cirocco could think of nothing to say for a very long time. She realized her mouth was open.

"You're serious, aren't you?"

"Utterly."

"I don't know quite how to put this."

Gaea sighed. "I wish you wouldn't be afraid of me. I assure you, you are in no danger from me."

Gaby leaned forward. "How can we know that? You . . ." She stopped herself, and glanced at Cirocco.

"I destroyed your ship. That's item two on the agenda, I'm sure. There are many things you don't know about that. Would you like some more coffee?"

"Not now, thank you," Cirocco said, hastily. "Gaea, or your holiness, or whatever I'm supposed to call you—"

"Gaea is fine."

"—we don't like war. *I* don't, and I don't think any sane person does. Surely you've seen antiwar movies, too."

She frowned, and chewed on a knuckle.

"Of course I have. But they were in the minority, and even then, they were *popular*. They contained more bloodshed than most of the *pro*war movies. You *say* you don't like war, but why are you so fascinated by it?"

"I don't know the answer to that. All I know is I hate war, and the titanides hate it, too. They would like to see it stopped. That's what I came here to ask you."

"No war?" She peered at Cirocco suspiciously.

"No."

"Not even a skirmish now and then?"

"Not even that."

Gaea's shoulders slumped, then heaved in a great sigh.

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"Very well," she said. "Consider it done."

"I hope it wouldn't be too much trouble," Cirocco went on. "I don't know how you go about—"

"It's *done*!" The room was lit by a flash of lightening that made a crown around Gaea's head. The thunderclap brought Gaby and Cirocco to their feet. Gaby had her sword half out of its scabbard, standing between Cirocco and Gaea.

Several uncomfortable seconds passed.

"I didn't mean to do that," Gaea said, her hands fluttering nervously. "It was just . . . well, something of a disappointment." She sighed, and motioned them to their seats.

"I should have said it's *being* done," she elaborated, when things had calmed down. "I'm recalling all the angels and titanides. The reprogramming will take a while."

"Reprogramming?" Cirocco said, suspiciously.

"No one will be hurt, my dear. The ground will swallow them up. They'll emerge after a time, free of the compulsion. Satisfied?"

Cirocco wondered what the alternative was, but nodded her head.

"Very good. Now to the other matter. Your ship.

"I didn't do it."

She held up her hand, waited until she was sure Cirocco would not interrupt her, then went on.

"I know I told you I was the whole world, that I *am* Gaea. That was completely true at one time. Now it is less so. Bear in mind that I'm three million, one thousand, two hundred and sixty-six years old." She paused, and raised one eyebrow.

"Three million . . ." Cirocco's eyes narrowed. "That's what you said your life span was."

"Correct. I am old by my own standards, not just yours. You've seen it on the rim and in the hub. My deserts are drier and my wastelands deeper in ice than they have ever been, and I can do nothing about it. I doubt that I'll live another hundred thousand years."

Suddenly Cirocco laughed. Gaby looked startled and Gaea merely sat politely, her head cocked to one side, until Cirocco got it under control.

"Pardon me," Cirocco said, still gasping, "but somehow, I find it hard to be properly sympathetic. Only a hundred thousand years!" She laughed again, and this time Gaea joined in.

"You're right," she said. "There's still plenty of time to send flowers. I could outlive your whole race." She cleared her throat. "But back to what I was saying. I'm dying. I am malfunctioning in thousands of ways—still holding together, mind you, but not what I once was.

"Think of a dinosaur. A brain in its head, another in its rump. Decentralized control over a bulky body.

"I work the same way. When I was young my auxiliary brains worked with me, as your fingers obey you. In the last half million years that has changed. I've lost much control over my outlying areas. There are twelve

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separate intelligences on the rim, and I am fragmenting into two personalities even at my central nerve nexus, in the hub.

"In a way, it's like the Greek theogony I've grown so fond of. My children tend to be unruly, willful, antagonistic. I fight them constantly. There are good lands and bad lands down there. Hyperion is one of the good ones. She and I get along well.

"Rhea is tempermental and quite mad, but at least I can often wheedle her into doing the right thing.

"But Oceanus is the worst. He and I do not speak any more. What I do in Oceanus I do by misdirection, by deceit, by cunning.

"It was Oceanus that snared your ship."

CHAPTER TWENTY-TWO

Oceanus brooded for ten thousand years while he felt Gaea's grip grow weaker. There was still a chance she could wipe out the budding independence he concealed so carefully. His grievances festered.

Why must *he* be in the dark? He, the mightiest of oceans, eternally covered with ice. The life that struggled on the bleak ground above him was stunted. Many of his children would die in the full light of day. What was so good about Hyperion, that he should be so lush and fair?

Quietly, a few meters a day, he extended a nerve beneath the ground until he could speak directly to Rhea. He recognized the seeds of insanity in her, and began casting his eyes to the west for an ally.

Mnemosyne was no good. She was desolate, physically and emotionally, mourning the passing of her lush forests. Try as he might to kindle resentment against Gaea, Oceanus could not penetrate the depths of Mnemosyne's depression. He tunneled on.

Beyond Mnemosyne was the night region of Cronus. Gaea's grip was strong here; the satellite brain that held sway over the territory was a tool of the overmind, and had not as yet developed a personality of his own.

Oceanus kept moving west. Without realizing it, he was laying a communications net that would unite the six rebellious lands.

He found his strongest ally in Iapetus. If only he had been closer, they might have overthrown Gaea. But the tactics they imagined depended on close physical cooperation, so he and Iapetus could only plot together. He was forced to fall back on his alliance with Rhea.

He made his move around the time the pyramids were being built on Earth. Without warning, he stopped the flow of coolant fluids passing through his immense body and through the support cables he controlled. At the far eastern end of the sea that dominated his frozen landscape, he had control of two river pumps—huge three-chambered muscles that lifted the waters of Ophion into western Hyperion. He stopped their massive beating. To the east, Rhea did the same with the five pumps that raised water over her east-

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ern mountain ranges, while speeding the operation of her pumps near Hyperion. Shut off from the west and sucked dry from the east, Hyperion began to wither.

In a few days, Ophion ceased to flow.

"I got all this second-hand from Rhea," Gaea said. "I had known I was losing control of my peripheral brains, but no one had mentioned any grievances. I had not imagined they could exist."

It had grown gradually darker as Gaea told of the rebellion of Oceanus. Most of the luminescent floor panels had gone out. Those remaining gave off a flickering orange glow. The walls of the room receded in the gloom.

"I knew I had to do something. He was about to destroy whole ecosystems; it might be a thousand years before I could put them together again."

"What did you do?" Gaby whispered. Cirocco jumped; Gaea's quiet voice had nearly mesmerized her.

She held out her hand, slowly made a fist that looked like a lump of stone.

"I *squeezed*."

The vast, circular muscle had been dormant for three million years. It had only one function: to contract the hub and draw out the spokes behind it, just after the Titan was born. Gaea's network of cables depended from it. It was the center of her rigging, the mighty anchor that held her together.

It jerked.

Gigatonnes of ice and rock leaped into the air.

Ten thousand square kilometers of Oceanus' surface rose like an express elevator. The frozen sea turned to slush, embedded with ice cubes the size of city blocks. All over Gaea, cable strands snapped like rotten rope: raveling, snarling, flailing the land beneath them.

The muscle relaxed.

For one giddy moment weightlessness reigned in Oceanus. Kilometer-square ice floes drifted like snowflakes, turning in the hurricane that had begun to blow from the hub.

When Oceanus bottomed out, fifteen cables twanged the deadly music of Gaea's revenge. The sonic energy alone stripped ten meters of topsoil from the surrounding regions and hurled opposing dust storms a dozen times around the rim before their fury abated.

Like a hand squeezing a ball, the muscle in the hub contracted and relaxed in a two-day rhythm that made Gaea vibrate like a plucked rubber band.

She had one more trick, but she waited until the cataclysm had flayed Oceanus to the bare rock. She had only six other muscles. Now she flexed one of them.

The spoke that towered over Oceanus contracted, squeezed to half its normal diameter. Deprived of water for over a week, the trees were tinder-dry. They fractured, sloughing off their tenuous grip in Gaea's flesh, and

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began to fall.

On the way down, they began to burn.

Oceanus was an inferno.

"I meant to burn the bastard," Gaea said. "I meant to cauterize him for all time."

Cirocco coughed, and reached for her forgotten drink. The ice cubes clicked alarmingly in the silence and near-darkness.

"He was too deep, but I put the fear of God into him." She chuckled quietly. "I burned myself in the process—the fire damaged my lower valve, and from then on I've blasted him with hurricanes and noise every seventeen days. The sound is not my Lament; it's my warning. But it was worth it. He was a very good boy for thousands of years. Make no mistake, you can't have a dozen gods running a world. The Greeks knew what they were talking about.

"But the catch, you see, is that his fate is linked with mine. He's another part of my mind, so in your terms, I'm insane. It will destroy us all, eventually, the good with the bad.

"But he was on his best behavior until you came along.

"I had planned to contact you a few days before you arrived here. It was my intention to pick you up with Hyperion's external grapples. I assure you I could have done it delicately, not breaking any glassware.

"Oceanus exploited my weakness. My radio transmission organs are on the rim. There were three of them, but one broke down ages ago. The others are in Oceanus and Crius. Crius is my ally, but Rhea and Tethys managed to destroy his transmitter. Suddenly all my communications were in the hands of Oceanus.

"I decided not to make the pick-up. Not having been in contact with me, you would surely have misinterpreted it.

"But Oceanus wanted you for himself."

The battle raged beneath the surfaces of Oceanus and Hyperion. It was *fought in the great conduits that supplied* the nutrient fluid known as Gaea's milk.

Each of the human captives was encapsulated in a protective jelly while their fates were decided. Their metabolic rates were slowed. Medically, they were comatose, unaware of their surroundings.

The weapons of the war were the pumps that impelled nutrients and coolants through the underworld. Great pressure imbalances were created by both combatants, so that at one point a geyser of milk broke through in Mnemosyne and spurted a hundred meters into the air, to fall on the sands and fuel a brief spring.

They battled for the better part of a year. Then at last, Oceanus knew he was losing. The prizes began to flow toward Hyperion under the staggering pressure Gaea built from Iapetus, Cronus, and Mnemosyne.

Oceanus changed his tactics. He reached into the minds of his captives

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and woke them up.

"I had been afraid all along he'd do that," Gaea said, as the room lights threatened to gutter into oblivion. "He had a link into your brains. It became imperative for me to sever that link. I used tactics that I don't think you'd understand. In the process, I lost one of you. When I got her back, she had been changed.

"He was trying to destroy you all before I got you—your minds, not your bodies. That would have been easy enough. He flooded you with information. He implanted the whistle speech in one of you, the songs of the titanides in two more. That any of you survived with your sanity is a source of amazement to me."

"Not all of us did," Cirocco said.

"No, and I'm sorry. I'll try to make it up to you, somehow."

While Cirocco was wondering what could possibly be done to put things right, Gaby spoke up.

"I remember climbing a huge stairway," she said. "I passed through golden gates, and stood at the feet of God. Then a few hours ago it seemed like I was in the same place again. Can you explain that?"

"I talked to all of you," Gaea said. "In your condition, mentally pliable from days of sensory deprivation, you put your own interpretation on it."

"I don't recall that at all," Cirocco said.

"You blanked it. Your friend Bill went further, and blanked most of his memories.

"Interveiwing you through Hyperion, I decided what must be done. April was too far indoctrinated with angel culture and customs. Trying to return her to what she had been would have destroyed her. I transported her to the spoke and let her emerge to find her own destiny.

"Gene was sick in his mind. I took him to Rhea, hoping that he would remain separated. You should watch out for him.

"As for the rest of you, it was imperative that you be returned at once to full consciousness. There was not even time to bring you together. I hoped you would make your way up here, and in time, you did. And now you can go home."

Cirocco looked up quickly.

"Yes, the rescue ship is here. It's under the command of Captain Wally Svensen, and—"

"Wally!" Gaby and Cirocco said it simultaneously.

"A friend? You'll see him soon. Your friend Bill has been talking to him for two weeks now." Gaea looked uncomfortable, and when she spoke again there was a hint of petulance in her voice. "It's a bit more than a rescue mission, actually."

"I thought it might be."

"Yes. Captain Svensen is equipped to wage a war with me. He has a large number of nuclear bombs, and his presence out there is making me nervous. That's one of the things I wanted to ask you. Could you put in a good word? I couldn't possibly be a threat to the Earth, you know."

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Cirocco hesitated a moment, and it was Gaea's turn to look uncomfortable.

"Yes, I think I can straighten it out."

"Thanks so much. He didn't actually *say* he was going to bomb me, and when he discovered there were survivors from *Ringmaster* that possibility became more remote. I've talked to him, now that Oceanus is cooperating again. I've picked up some of his scout ships, and they are in the process of constructing a base camp near Titantown. You can explain to him what happened, as I'm not sure he believes me."

Cirocco nodded, and said nothing for a long time, waiting for Gaea to continue. She did not, and eventually Cirocco had to speak.

"How do we know we can *believe* all this?"

"I can give you no assurances. I can only ask you to believe the story as I told it."

Cirocco nodded again, and stood up. She tried to make it casual, but no one had been expecting it. Gaby looked confused, but got to her feet.

"It's been interesting," Cirocco said. "Thanks for the coke."

"Let's don't be hasty," Gaea said, after an astonished pause. "Once I return you to the rim I won't be able to speak to you directly."

"You can send me a postcard."

"Do I detect a hint of anger?"

"Maybe."

"I'm sorry you feel that way."

Cirocco shook her head tiredly. "Skip it," she said. "I'm feeling a little let down, that's all."

Gaby cocked an eyebrow at her, but said nothing. It irritated Cirocco, and it didn't help when Gaea seemed interested in the statement, too.

"I have a question," Gaby said, suddenly. She had been quiet for a long time, seemingly satisfied to let Cirocco do the negotiating. "Was this trip really necessary?"

Cirocco waited, having had doubts about that part of the story herself.

"You're right," Gaea admitted. "I could have brought you here directly. Obviously, since I brought April more than halfway. There would have been some risk with the additional time in isolation, but I could have put you back to sleep."

"Then why didn't you?" Cirocco demanded.

Gaea threw up her hands.

"Let's stop kidding each other, shall we? Number one, I don't know if I owed it to you. Number two, I was—and still am—a bit frightened of you. Not you personally, but humans. You're inclined to be hasty."

"I won't argue with that."

"You made it up here anyway, didn't you? That's what I wanted to see: if you could do it. And you should be thanking me for it, because you had a great time."

"I can't imagine how you could think a thing like—"

"We're being honest now, remember? You're really overjoyed that you're about to go home now, aren't you?"

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"Well, of course I—"

"Everything about you says you're not. You've had a goal to achieve—getting up here. Now it's over. The best time of your life. Deny that if you can."

Cirocco was nearly speechless. "How can you say that? I saw my lover nearly killed. April has been turned into a monster, August is—"

"You expected it to be easy? Do you blame me for it?

"You *want* to blame me. It would make it easier to leave. You find it hard to admit that even with those things that happened to your friends—none of it your fault—you've had a great adventure."

"That's the most—"

"Captain Jones, I submit to you that you were never really cut out to be a captain. Oh, you've done well, just like you do a good job of most things you tackle. But you're not a captain. You don't enjoy ordering other people around. You like your independence, you like to go to strange places and do exciting things. In an earlier age you would have been an adventurer, a soldier of fortune."

"If I'd been born a man," Cirocco corrected.

"That's because it's only recently that women have had a crack at adventure on their own. Space was the only frontier available to you, but it's done by the numbers, very civilized. It's not really your cup of tea."

Cirocco had given up on trying to stop her. It was all so farfetched, she decided to let Gaea ramble on.

"No, what you're cut out for is exactly what you've been doing. Scaling the unscalable mountain. Communing with strange beings. Shaking your fist at the unknown, spitting in God's eye. You did all those things. You got hurt along the way; if you keep on that path you'll be hurt more. You'll freeze and go hungry and bleed and fall down from exhaustion. So what do you want? Spend the rest of your life behind a desk? Go home; it's waiting for you."

Far down the curved abyss that was Gaea's hub, wind howled faintly. Somewhere volumes of air were being sucked into a vertical chamber three hundred kilometers high, and that chamber was peopled by angels. Cirocco looked around her, and shivered. To her right, Gaby was smiling. What does she know that I don't know? Cirocco wondered.

"What are you offering me?"

"A chance at a long life span, with the possibility that it might be quite short. I'm offering good friends and evil enemies, eternal day and endless night, rousing song and strong wine, hardships, victories, despair and glory. I'm offering you the chance at a life you won't find on Earth, the kind of life you knew you wouldn't find in space but hoped for anyway.

"I need a representative on the rim. It's been a long time since I've had one, because I demand a lot. I can give you certain powers. You'll define your job, pick your hours and companions, see the world. You'll get some help from me, but little interference.

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"How would you like to be a wizard?"

CHAPTER TWENTY-THREE

Seen from the air, the expedition base camp was an ugly brown flower. A ragged wound had opened in the soil just east of Titantown and had begun discharging Earth people.

It looked like it would never stop. As Cirocco watched from Whistlestop's gondola, a blue glob of gelatin shaped like a pill oozed from the ground and fell on its side. The encapsulating material quickly turned to water and sloughed away from a silvery crawler-transporter. The vehicle churned through the sea of mud and made its way to a rank of six similar machines parked beside a complex of inflatable domes before discharging its five passengers.

"These folks came in style," Gaby observed.

"Looks that way. And that's just the landing party. Wally won't bring his ship in close enough to get picked up."

"You sure you want to go down there?" Gaby asked.

"I have to. Surely you know that."

Calvin looked it all over and sniffed.

"If it's all the same to you," he said, "I'll just stay up here. It might get nasty if I went down."

"I can protect you, Calvin."

"That remains to be seen."

Cirocco shrugged. "Maybe you'd like to stay, too, Gaby."

"I go where you go," she said, simply. "Surely you know *that*. Do you think Bill's still down there? He might have been evacuated by now."

"I think he'd wait. And besides, I have to go down to get a look at *that*."

She pointed to a shiny heap of metal a kilometer west of the camp, sitting in its own flower of overturned dirt. There was no pattern to it, no hint that it had ever been more than a scrap heap.

It was the bones of *Ringmaster*.

"Let's hit the silk," Cirocco said.

". . . and says she was actually working in our interests throughout the alleged aggressive incident. I can offer you no concrete proof of most of these statements. There can be no proof, except the pragmatic one of her behavior over a suitable time. But I see no evidence that she is a threat to humanity, now or in the future."

Cirocco sat back in her chair and reached for her glass of water, wishing it was wine. She had talked for two hours, interrupted only by Gaby amplifying or correcting details of her account.

They were in a round dome that served as mission command headquarters for the ground party. The room was adequate for the seven assembled officers, Cirocco, Gaby and Bill. The two women had been brought there promptly when they landed, introduced to everyone, and asked to begin the debriefing.

Cirocco felt out of place. The crew of the *Unity* and Bill were dressed in

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spotless, wrinkle-free red and gold uniforms. They *smelled* clean.

And they looked entirely too military for Cirocco's tastes. The *Ringmaster* expedition had avoided that, even eliminating military titles except captain. At the time *Ringmaster* was launched, NASA had been at pains to erase its military origins. They had sought U.N. auspices for the trip, though the notion that the expedition was anything but American was a transparent fiction. Still, it had been something.

Unity, by her very name, testified that the nations of Earth were cooperating more closely. Her multinational crew proved that the *Ringmaster* experiment had drawn the nations together in a common purpose.

But the uniforms told Cirocco what that purpose was.

"Then you counsel a continuation of our peaceful policy," Captain Svensen said. He spoke through a television set on the fold-up desk in the center of the room. Aside from the chairs, it was the only article of furniture.

"The most you can lose is your exploratory party. Face it, Wally. Gaea knows that would be an act of war, and that the next ship would not even be manned. It would be one big H-bomb."

The face on the screen frowned, then nodded.

"Excuse me for a moment," he said. "I want to talk this over with my staff." He started to turn away, then reversed the motion.

"What about you, Rocky? You didn't say if you believe her. Is she telling the truth?"

Cirocco didn't hesitate.

"Yes, she is. You can bank on it."

Lieutenant Strelkov, the ground commander, waited until he was sure the captain had nothing more to say, then stood. He was a handsome young man with an unfortunate chin and—though Cirocco found it hard to believe—he was a solider in the Soviet Army. He seemed little more than a child.

"Could I get you anything?" he asked, in excellent English. "Perhaps you're hungry after your trip back here."

"We ate just before we jumped," Cirocco said, in Russian. "But if you had any coffee. . . ?"

"You didn't really finish your story," Bill was saying. "There's the matter of getting back down after your conversation with god."

"We jumped," Cirocco said, sipping her coffee.

"You . . ."

She and Bill and Gaby were in one "corner" of the round room, their chairs drawn together, while the *Unity*'s officers buzzed at each other around the television set. Bill looked good. He walked with a crutch and his leg apparently hurt when he stood on it, but he was in high spirits. The *Unity*'s doctor said she could operate on him as soon as he was aboard, and thought he would be nearly as mobile as before.

"Why not?" Cirocco said, with a

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faint smile. "We brought those chutes all the way up as a safety measure, but why not use them?" His mouth was still open. She laughed, relenting, putting her hand on his shoulder. "All right, we thought about it a *long* time before we jumped. But it really wasn't dangerous. Gaea held the top and bottom valves open for us and called Whistlestop. We did it free-fall for the first four hundred kilometers, then landed on his back." She held out her cup while an officer poured more coffee, then turned back to Bill.

"I've talked enough. What about you? How did things go?"

"Nothing so interesting, I'm afraid. Gene ran off, but he shows up from time to time. I spent my time in therapy with Calvin, and picked up a little Titanide."

"How old was she?"

"How . . . the *language*, you idiot," he laughed. "I learned how to sing goo-goo and wa-wa and Bill hungry. I had a great time. Then I decided to get off my ass and *do* something since you wouldn't take me along. I started talking to the titanides about something I knew a little about, which was electronics. I learned about coppervines and batteryworms and IC nuts, and before long I had a receiver and transmitter."

He grinned at the look on Cirocco's face.

"Then it wasn't . . ."

He shrugged. "Depends on how you look at it. You kept thinking in terms of a radio that would reach Earth. I can't build that. What I have isn't very strong—I can only talk to *Unity* when it's above, and the signal only has to punch through the roof. But even if I'd built it before you left, you probably would have gone, wouldn't you? *Unity* wasn't here yet, so the radio would have been useless."

"I suppose I would have. I had other things to do."

"I heard." He grimaced. "That gave me the worst moments of the trip," he confessed. "I'd started to like the titanides, and then out of nowhere they all get this dreamy look and hurry out into the grassland. I thought it was another angel attack, but none of them came back. All I ever found was a big hole in the ground."

"I noticed a few when we came in," Gaby said.

"They've been drifting back," Bill said. "They don't remember us."

Cirocco's mind had been wandering. She was not concerned about the titanides; she knew they would be all right, and now they would not have to suffer in the fighting. But it was sad to know Hornpipe would no longer remember her.

She had been watching the *Unity* people, wondering why no one came over to talk. She knew she did not smell very good, but didn't think that was the reason. With some surprise, she realized they were afraid of her. The thought made her grin.

She realized Bill had been talking to her.

"I'm sorry, what was that?"

"Gaby says you haven't told the whole story yet. She says there's

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something more, and that I should hear it."

"Oh, that," Cirocco said, glaring at Gaby. But it had to come out soon, anyway.

"Gaea, she offered me a job, Bill."

"A job?" He raised his eyebrows, smiled tentatively.

" 'Wizard,' she called it. She tends to the romantic. You'd probably like her."

"Just what did the job entail?"

Cirocco spread her hands. "General troubleshooting, nature unspecified. Whenever she had a problem I'd go there and see what I could do. There are—literally—some unruly lands down here. She could promise me limited immunity, a sort of conditional passport based on the fact that the regional brains would remember what she did to Oceanus and not dare to harm me while I traveled through them."

"That's all? Sounds like a chancy proposition."

"It is. She offered to educate me, to fill my head with a tremendous amount of lore in the same way I was taught to sing Titanide. I'd have her support and backing. Nothing magic, but I'd be able to cause the ground to open up and swallow my enemies."

"That I can believe."

"I took the job, Bill."

"I thought so."

He looked down at his hands, seemed very tired when he looked up again.

"You're really something else, you know?" He said it with a trace of bitterness, but was taking the news better than Cirocco had expected. "It sounds like the kind of job that would appeal to you. The left hand of God." He shook his head. "Damn, this is really a hell of a place. You may not like it, you know. I was just starting to, when all the titanides disappeared. That shook me, Rocky. It really seemed like someone had just put away his toys because he was tired of the game. How do you know you won't be one of her toys? You've been your own boss; do you think you still will be?"

"I honestly don't know. I just couldn't face going back to Earth, back to a desk job and the lecture tour. You've seen over-the-hill astronauts. I could land a job on the board of directors of some big corporation." She laughed, and Bill smiled slightly.

"That's what *I'm* going to do," he said. "But I'm hoping for the research department. Leaving space doesn't scare me. You know I'll be going back, don't you?"

Cirocco nodded. "I knew it when I saw your nice new uniform."

He chuckled, but there was little mirth in it. They looked at each other for a time, then Cirocco reached out and took his hand. He smiled with one corner of his mouth, leaned over and kissed her lightly on the cheek.

"Good luck," he said.

"You too, Bill."

Strelkov cleared his throat.

"Captain Jones, Captain Svensen would like to talk to you now."

"Yes, Wally?"

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"Rocky, we've sent your report on to Earth. It will take some analysis, so there won't be a definite decision for a few days. But we up here have added our recommendation to yours, and I don't think there will be any problem. I expect to upgrade the base camp to a cultural mission and United Nations Embassy. I'd offer you the job of ambassador, but we brought someone along in case our negotiations were successful. Besides, I expect you're anxious to get back."

Gaby and Cirocco laughed, and Bill joined in soon after.

"Sorry, Wally. I'm not anxious to go back. I'm *not going* back. And I couldn't take the job even if you offered it."

"Why not?"

"Conflict of interest."

She had known it would not be that simple, and it was not.

She formally resigned her commission, explained her reasons to Captain Svensen, then listened patiently as he told her, in increasingly peremptory terms, just why she had to go back, and for good measure, why Calvin had to return as well.

"The doctor says he can be treated. Bill's memory can be restored, Gaby's phobia can probably be cured."

"I'm sure Calvin can be cured, but he's happy where he is. Gaby's already *been* cured. But what do you plan to do for April?"

"I was hoping you could help coax her to come back to us before you came aboard. I'm sure—"

"You don't know what you're talking about. I'm not going back, and that's all there is to be said. It's been nice talking to you." She turned on her heel and strode from the room. No one tried to stop her.

She and Gaby made their preparations in a field a short distance from the base camp, then stood side by side, waiting. It was taking longer than she had expected. She began to get nervous, glancing at Calvin's battered watch.

Strelkov came racing out the door, shouting orders to a group of men busy erecting a shed for the crawlers. He stopped suddenly, caught flat-footed when he realized Cirocco was not far away, waiting for him. He motioned the men to stay put, and came toward the two women.

"Im sorry, Captain, but Commander Svensen says I have to place you under arrest." He seemed genuinely apologetic, but his hand was close to his side arm. "Will you come with me, please?"

"Look over there, Sergei." She pointed over his shoulder.

He started to turn, then drew his weapon in sudden suspicion. He backed away and to one side until he could steal a glance to the west.

"Gaea hear me!" Cirocco shouted. Strelkov eyed her nervously. She carefully made no threatening gestures, but raised her arms in the direction of Rhea, toward the place of winds and the cable she had climbed with Gaby.

There were shouts behind them.

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A wave was traveling down the cable, almost imperceptibly, but producing a definite kink like the wave that moves through a garden hose when it is given a quick flip from the wrist. The effect on the cable was explosive. A cloud of dust expanded all around it. In the dust were trees torn out at the roots.

The wave hit the ground, and the place of winds bulged, shattered, sent rocks high into the air.

"Cover your ears!" Cirocco yelled.

The sound hit all at once, throwing Gaby to the ground. Cirocco was staggered, but stood her ground as all the thunder of the gods rolled around her, the tatters of her clothes streaming out as the shock wave hit and the winds began to blow.

"Look!" she shouted again, holding out her hands and raising them slowly toward the sky. No one could hear her, but they saw as a hundred waterspouts broke through the dry ground, turning Hyperion into a mist-shrouded fountain. Lightning crackled through the thickening fog, the sound of it swallowed in the mightier roar that still reechoed from the distant walls.

It took a long time for it to die away, and in all that time no one moved. When it was quiet again, long after the last fountain had turned to a trickle, Strelkov was sitting where he had fallen, still looking at the cable and the settling dust.

Cirocco went to him and helped him to his feet.

"Tell Wally to leave me alone," she said, and walked away.

"That was very slick," Gaby said, later. "Very slick indeed."

"All done with mirrors, my dear."

"How did it make you feel?"

"I nearly wet my pants. You know, one could learn to get off on that. It was tremendously exciting."

"I hope you don't have to do it very often."

Cirocco silently agreed with her. It had been a close thing. The demonstration, awesome for having occurred at her command, would have been merely inexplicable if it had arrived before Strelkov came out of the dome to threaten her.

The fact was that she could not repeat the performance for five or six hours, even if she asked for another at that very moment.

She could communicate readily enough with Gaea. There was a master radio seed in her pocket. But Gaea could not react quickly. To do anything as awesome as she had just accomplished, she needed hours of preparation time.

Cirocco had sent the message requesting the stunt while still on Whistlestop, after carefully considering the likely sequence of events. From that time, it had been a nervous dance with the clock, drawing out her story here, skimping on the answer to a question there, always with the knowledge of the forces gathering in the hub and under her feet. Her advantage had been the leeway she had in timing her resignation, but the drawback was estimating the time it would take Wally Svensen to order

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her arrest.

She could see wizarding was not going to be easy.

On the other hand, not all of her job would be as finicky as calling in an air strike from heaven.

Her pockets were stuffed with the things she had brought as backup measures in case the blood and thunder failed to intimidate the ground party, things she had obtained foraging through Hyperion before reboarding Whistlestop and traveling to the base camp. There was an eight-legged lizard who could spit a tranquilizing agent when squeezed, and an odd assortment of berries that would do the same job taken internally. She had leaves and bark that could be turned into flash powder and, as a last resort, a nut that made a hand grenade.

There were libraries of wildlife lore in her head; if there were Gaean girl scouts, she would own all the merit badges. She could sing to the titanides, whistle to the blimps, and croak, twitter, chirp, rumble and moan in a dozen languages she had not even had a chance to use, to creatures she had not yet encountered.

She and Gaby had worried that all the information Gaea proposed to give them would not fit into human brains. Oddly, it had been no trouble at all. They were not even aware of any changes; when they needed to know something, they knew it, just as if they had learned it in school.

"Time to head for the hills?" Gaby suggested.

"Not yet. I don't think we'll have any more trouble from Wally, once he adjusts to the idea. They'll see that we're more valuable if they maintain good relations with us.

"But there's one more thing I want to see before we go."

She had been prepared for an emotional moment. It was, but not as bad as she had feared, and not in the way she had expected. Saying good-bye to Bill had been harder.

The wreck of *Ringmaster* was a sad, silent place. They walked through it without speaking, recognizing pieces here and there, more often unable to tell what a twisted hunk of metal had been.

The silver hulk gleamed dully in the beautiful afternoon of Hyperion, partly embedded in the dusty ground like a robot King Kong after the fall. Already the grasses had established a foothold in the turned soil. Vines crept over shattered components. A single yellow flower bloomed in the center of what had been her command console.

She had hoped to find some momento of her former life, but she had never been acquisitive and had brought little of a personal nature with her. The few photos would have been eaten, along with the log book and the envelope of newspaper clippings. It would have been nice to come across her class ring—she could see it sitting on the shelf beside her bunk where she had last removed it—but the chances were against it.

They saw a crewman from *Unity* some distance away from them. He

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was clambering over the wreckage, pointing his camera and snapping indiscriminately. Cirocco thought he was the ship's photographer, then realized he was doing it on his own time, with his own camera. She saw him pick up the object and put it in his pocket.

"Come back here in fifty years," Gaby observed, "they're likely to have carted it all away." She looked around speculatively. "This looks like a nice spot for a souvenir stand. Sell film and hot dogs; you'd do pretty good."

"You think that'll happen?"

"It's up to Gaea, I guess. She did say she'd let people visit. That means tourism."

"But the cost . . ."

Gaby laughed. "You're still thinking of the *Ringmaster* days, Captain. It was all we could do then to get seven of us out here. Bill says *Unity* has a crew of two hundred. How would you have liked to get the film concession at O'Neil One thirty years ago?"

"I'd be rich by now," Cirocco conceded.

"If there's a way to get rich here, somebody'll do it. So why don't you make me Minister of Tourism and Conservation? I'm not sure how I like the role of sorcerer's apprentice."

Cirocco grinned. "You've got it. Try to keep the bribes and nepotism down to a minimum, will you?"

Gaby swept her arm in a circle, a faraway look in her eyes.

"I can see it now. We'll put the taco stand over there—a classical Greek motif, naturally—and we can sell Gaeaburgers and milk shakes. I'll keep the billboards down to fifty meters, tops, and limit the use of neon. 'See the angels! Smell the breath of God! Shoot the rapids on the Ophion! This way to the centaur rides, only one thin sawbuck! Don't forget to bring—' "

She yelped and danced to one side as the ground moved.

"I was *kidding*, damn it!" she yelled at the sky, then looked suspiciously at Cirocco, who was laughing.

An arm came from the spot where Gaby had been standing. Loose dirt shifted to reveal a face, and a mop of multicolored hair.

They knelt and brushed sand away from the titanide as she coughed and spit, until she had managed to free her torso and front legs. She paused to gather strength, and looked curiously at the two women.

"Hello." Hornpipe sang. "Who are you?"

Gaby got to her feet and held out her hand.

"You really don't remember us, do you?" she sang.

"I recall something. It *does* seem as if I knew you. Didn't you give me some wine, long ago?"

"I did," Gaby sang. "And you returned the favor."

"Come out of there, Hornpipe," Cirocco sang. "You could use a bath."

"I remember you, too. But how do you manage to stay balanced for so long without falling over?"

Cirocco laughed.

"I wish I knew, kid." ■

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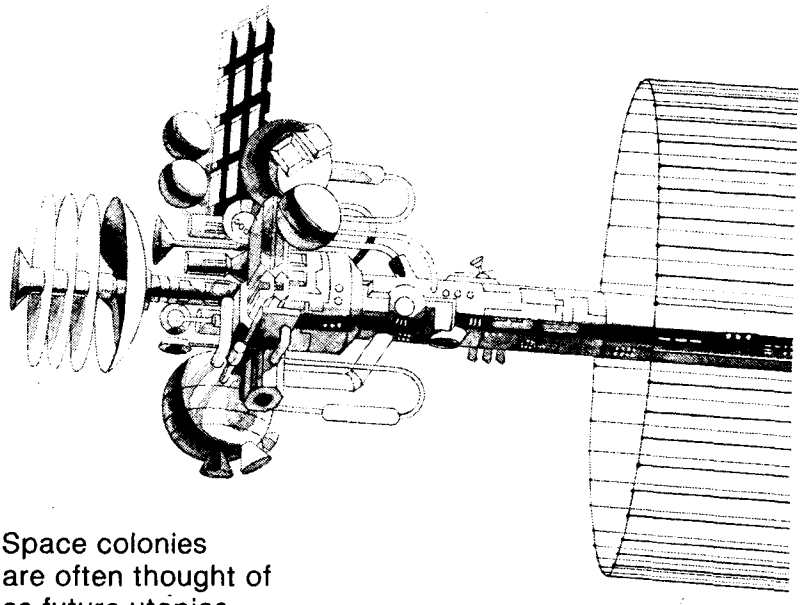
REDEEMER



Space colonies are often thought of as future utopias. But consider past utopias, such as Athens, New Rome, America . . .

GREGORY BENFORD

He had trouble finding it. The blue-white exhaust plume was a long trail of ionized hydrogen scratching a line across the black. It had been a lot harder to locate out here than Central said it would be.

Nagara came up the *Redeemer* from behind, their blind side. They wouldn't have any sensors pointed aft. No point in it when you're on a one-way trip, not expecting visitors and haven't seen anybody for seventy-three years.

He boosted in with the fusion plant, cutting off the translight to avoid overshoot. The translight rig was delicate and still experimental and it had already pushed him over seven light-years out from Earth. And anyway, when he got back to Earth there would be an accounting, and he would have to pay off from his profit anything he spent for overexpenditure of the translight hardware.

The ramscoop vessel ahead was running hot. It was a long cylinder, fluted fore and aft. The blue-white fire came boiling out of the aft throat, pushing *Redeemer* along at a little below a tenth of light velocity. Nagara's board buzzed. He cut in the null-mag system. The ship's skin, visible outside, fluxed into its superconducting state, gleaming like chrome. The readout winked and Nagara could see on the sim-board his ship slipping like a silver fish through the webbing of magnetic field lines that protected *Redeemer*.

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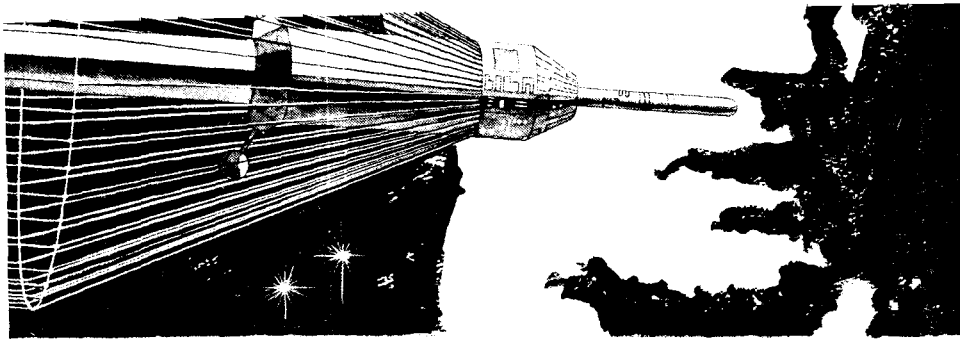

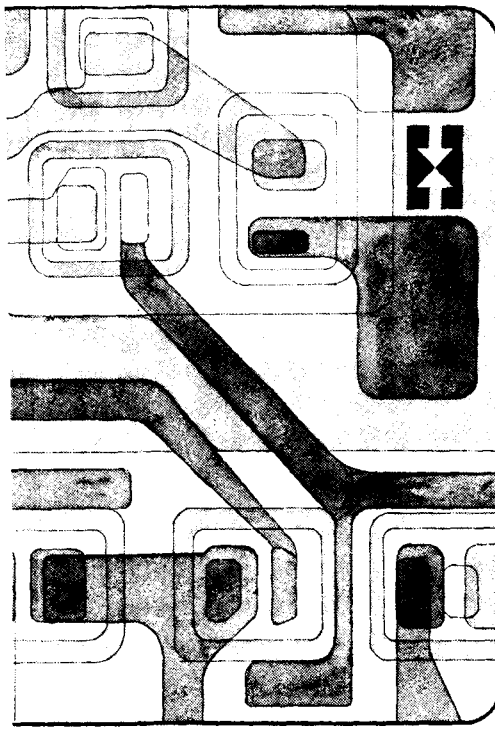

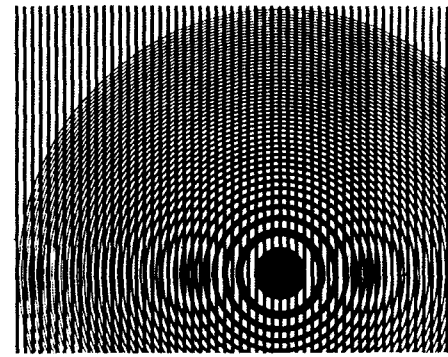

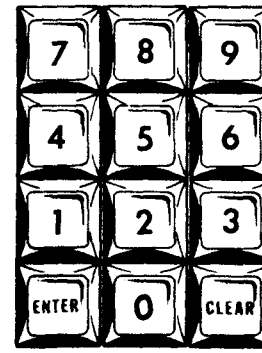

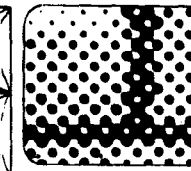

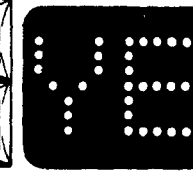

MIKE HINGE

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The field was mostly magnetic dipole. He cut through it and glided in parallel to the hot exhaust streamer. The stuff was spitting out a lot of UV and he had to change filters to see what he was doing. He came up along the aft section of the ship and matched velocities. The magnetic throat up ahead sucked in the interstellar hydrogen for the fusion motors. He stayed away from it. (There was enough radiation up there to fry you for good.)

Redeemer's midsection was rotating but the big clumsy-looking lock aft was stationary. Fine. No trouble clamping on.

The couplers seized *clang* and he used a waldo to manually open the lock. He would have to be fast now, fast and careful.

He pressed a code into the keyin plate on his chest to check it. It worked. The slick aura enveloped him, cutting out the ship's hum. Nagara nodded to himself.

He went quickly through the *Redeemer*'s lock. The pumps were still laboring when he spun the manual override to open the big inner hatch. He pulled himself through in the zero-g with one powerful motion, through the hatch and into a cramped suitup room. He cut in his magnetos and settled to the grid deck.

As Nagara crossed the desk a young man came in from a side hatchway. Nagara stopped and thumped off his protective shield. The man didn't see Nagara at first because he was looking the other way as he came through the hatchway, moving with easy agility. He was studying the subsystem monitoring panels on the far bulkhead. The status phosphors were red but they winked green as Nagara took three steps forward and grabbed the man's shoulder and spun him around. Nagara was grounded and the man was not. Nagara hit him once in the stomach and then shoved him against a bulkhead. The man gasped for breath. Nagara stepped back and put his hand into his coverall pocket and when it came out there was a dart pistol in it. The man's eyes didn't register anything at first and when they did he just stared at the pistol, getting his breath back, staring as though he couldn't believe either Nagara or the pistol was there.

"What's your name?" Nagara demanded in a clipped, efficient voice.

"What? I—"

"Your name. Quick."

"I . . . Zak."

"All right, Zak, now listen to me. I'm inside now and I'm not staying long. I don't care what you've been told. You do just what I say and nobody will blame you for it."

". . . nobody . . . ?" Zak was still trying to unscramble his thoughts and he looked at the pistol again as though that would explain things.

"Zak, how many of you are manning this ship?"

"Manning? You mean crewing?" Confronted with a clear question, he forgot his confusion and frowned. "Three. We're doing our five-year stint. The Revealer and Jacob and me."

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"Fine. Now, where's Jacob?"

"Asleep. This isn't his shift."

"Good." Nagara jerked a thumb over his shoulder. "Personnel quarters that way?"

"Uh, yes."

"Did an alarm go off through the whole ship, Zak?"

"No, just on the bridge."

"So it didn't wake up Jacob?"

"I . . . I suppose not."

"Fine, good. Now, where's the Revealer?"

So far it was working well. The best way to handle people who might give you trouble right away was to keep them busy telling you things before they had time to decide what they should be doing. And Zak plainly was used to taking orders.

"She's in the forest."

"Good. I have to see her. You lead the way, Zak."

Zak automatically half turned to kick down the hatchway he'd come in through and then the questions came out. "What—who *are* you? How—"

"I'm just visiting. We've got faster ways of moving now, Zak. I caught up with you."

"A faster ramscoop? But we—"

"Let's go, Zak." Nagara waved the dart gun and Zak looked at it a moment and then, still visibly struggling with his confusion, he kicked off and glided down the drift tube.

The forest was one-half of a one hundred meter long cylinder, located near the middle of the ship and rotating to give one g. The forest was dense with pines and oak and tall bushes. A fine mist hung over the tree tops, obscurring the other half of the cylinder, a gardening zone that hung over their heads. Nagara hadn't been in a small cylinder like this for decades. He was used to seeing a distant green carpet overhead, so far away you couldn't make out individual trees, and shrouded by the cottonball clouds that accumulated at the zero-g along the cylinder axis. This whole place felt cramped to him.

Zak led him along footpaths and into a bamboo-walled clearing. The Revealer was sitting in lotus position in the middle of it. She was wearing a Flatlander robe and cowl just like Zak. He recognized it from a historical fax readout.

She was a plain-faced woman, wrinkled and wiry, her hands thick and calloused, the fingers stubby, the nails clipped off square. She didn't go rigid with surprise when Nagara came into view and that bothered him a little. She didn't look at the dart pistol more than once, to see what it was, and that surprised him, too.

"What's your name?" Nagara said as he walked into the bamboo-encased silence.

"I am the Revealer." A steady voice.

"No, I meant your name."

"That is my name."

"I mean—"

"I am the Revealer for this stage of our exodus."

Nagara watched as Zak stopped halfway between them and then stood

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uncertainly, looking back and forth.

"All right. When they freeze you back down, what'll they call you then?"

She smiled at this. "Michele Astanza."

Nagara didn't show anything in his face. He waved the pistol at her and said, "Get up."

"I prefer to sit."

"And I prefer you stand."

"Oh."

He watched both of them carefully. "Zak, I'm going to have to ask you to do a favor for me."

Zak glanced at the Revealer and she moved her head a few millimeters in a nod. He said, "Sure."

"This way." Nagara gestured with the pistol to the woman.

The woman nodded to herself as if this confirmed something and got up and started down the footpath to the right, her steps so soft on the leafy path that Nagara could not hear them over the tinkling of a stream on the overhead side of the cylinder. Nagara followed her. The trees trapped the sound in here and made him jumpy.

He knew he was taking a calculated risk by not getting Jacob, too. But the odds against Jacob waking up in time were good and the whole point of doing it this way was to get in and out fast, exploit surprise. And he wasn't sure he could handle the three of them together. That was just it—he was doing this alone so he could collect the whole fee, and for that you had to take some extra risk. That was the way this thing worked.

The forest gave onto some corn fields and then some wheat, all the UV phosphors netted above. The three of them skirted around the nets and through a hatchway in the big aft wall. Whenever Zak started to say anything Nagara cut him off with a wave of the pistol. Then Nagara saw that with some time to think Zak was adding some things up and the lines around his mouth were tightening, so Nagara asked him some questions about the ship's design. That worked. Zak rattled on about quintuple-redundant fail-safe subsystems he'd been repairing until they were at the entrance to the freezing compartment.

It was bigger than Nagara had thought. He had done all the research he could, going through old faxes of *Redeemer*'s prelim designs, but plainly the Flatlanders had changed things in some later design phase.

One whole axial section of *Redeemer* was given over to the freezedown vaults. It was at zero-g because otherwise the slow compression of tissues in the corpses would do permanent damage. They floated in their translucent compartments, like strange fish in endless rows of pale, blue-white aquariums.

The vaults were stored in a huge array, each layer a cylinder slightly larger than the one it enclosed, all aligned along the ship's axis. Each cylinder was two compartments thick, a corpse in every one, and the long cylinders extended into the distance until the chilly fog steaming off them blurred the perspective and the eye

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could not judge the size of the things. Despite himself Nagara was impressed. There were thousands upon thousands of Flatlanders in here, all dead and waiting for the promised land ahead, circling Tau Ceti. And with seventy-five more years of data to judge by, Nagara knew something this Revealer couldn't reveal: The failure rate when they thawed them out would be thirty percent.

They had come out on the center face of the bulwark separating the vault section from the farming part. Nagara stopped them and studied the front face of the vault array, which spread away from them radially like an immense spider web. He reviewed the old plans in his head. The axis of the whole thing was a tube a meter wide, the same translucent organiform. Liquid nitrogen flowed in the hollow walls of the array and the phosphor light was pale and watery.

"That's the NDA storage," Nagara said, pointing at the axial tube.

"What?" Zak said. "Yes, it is."

"Take them out."

"What?"

"They're in fail-safe self-refrigerated canisters, aren't they?"

"Yes."

"That's fine." Nagara turned to the Revealer. "You've got the working combinations, don't you?"

She had been silent for some time. She looked at him steadily and said, "I do."

"Let's have them."

"Why should I give them?"

"I think you know."

"Not really."

He knew she was playing some game but he couldn't see why. "You're carrying DNA material for over ten thousand people. Old genotypes, undamaged. It wasn't so rare when you collected it seventy-five years ago but it is now. I want it."

"It is for our colony."

"You've got enough corpses here."

"We need genetic diversity."

"The System needs it more than you. There's been a war. A lot of radiation damage."

"Who won?"

"Us. The Outskirters."

"That means nothing to me."

"We're the environments in orbit around the sun, not sucking up to Earth. We knew what was going on. We're mostly in Bernal spheres. We got the jump on—"

"You've wrecked each other genetically, haven't you? That was always the trouble with your damned cities. No place to dig a hole and hide."

Nagara shrugged. He was watching Zak. From the man's face Nagara could tell he was getting to be more insulted than angry—outraged at somebody walking in and stealing their future. And from the way his leg muscles were tensing against a foothold Nagara guessed Zak was also getting more insulted than scared, which was trouble for sure. It was a lot better if you dealt with a man who cared more about the long odds against dart gun at this range than about some principle. Nagara knew he couldn't count on Zak ignoring all the

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Flatlander nonsense the Revealer and others had pumped into him.

They hung there in zero-g, nobody moving in the wan light, the only sound a gurgling of liquid nitrogen. The Revealer was saying something and there was another thing bothering Nagara, Some sound, but he ignored it.

"How did the planetary enclaves hold out?" the woman was asking. "I had many friends—"

"They're gone."

Something came into the woman's face. "You've lost man's *birthright*?"

"They sided with the—"

"Abandoned the planets altogether? Made them unfit to *live* on? All for your awful cities—" and she made a funny jerky motion with her right hand.

That was it. When she started moving that way Nagara saw it had to be a signal and he jumped to the left. He didn't take time to place his boots right and so he picked up some spin but the important thing was to get away from that spot fast. He heard a *chuung* off to the right and a dart smacking into the bulkhead and when he turned his head to the right and up behind him a burly man with black hair and the same Flatlander robes and a dart gun was coming at him on a glide.

Nagara had started twisting his shoulder when he leaped and now the differential angular momentum was bringing his shooting arm around. Jacob was already aiming again. Nagara took the extra second to make his shot and allow for the relative motions. His dart gun puffed and Nagara saw it take Jacob in the chest, just right. The man's face went white and he reached down to pull the dart out but by that time the nerve inhibitor had reached the heart and abruptly Jacob stopped plucking at the dart and his fingers went slack and the body drifted on in the chilly air, smacking into a vault door and coming to rest.

Nagara wrenched around to cover the other two. Zak was coming at him. Nagara leaped away, braked. He turned and Zak had come to rest against the translucent organiform, waiting.

"That's a lesson," Nagara said evenly. "Here's another."

He touched the keyin on his chest and his force screen flickered on around him, making him look metallic. He turned it off in time to hear the hollow boom that came rolling through the ship like a giant's shout.

"That's a sample. A shaped charge. My ship set it off two hundred meters from *Redeemer*. The next one's keyed to go on impact with your skin. You'll lose pressure too fast to do anything about it. My force field comes on when the charge goes, so it won't hurt me."

"We've never seen such a field," the woman said unsteadily.

"Outskirter invention. That's why we won."

He didn't bother watching Zak. He looked at the woman as she clasped her thick worker's hands together and began to realize what choices were

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left. When she was done with that she murmured, "Zak, take out the canisters."

The woman sagged against a strut. Her robes clung to her and made her look gaunt and old.

"You're not giving us a chance, are you?" she said.

"You've got a lot of corpses here. You'll have a big colony out at Tau Ceti." Nagara was watching Zak maneuver the canisters onto a mobile carrier. The young man was going to be alright now, he could tell that. There was the look of weary defeat about him.

"We need the genotypes for insurance. In a strange ecology there will be genetic drift."

BIOLOG

by Jay Kay Klein

Larry swears he has never been bored in his life. And he will cite you two dozen science fiction writers that generously gave him help along the way. For payback, he was enjoined, "Pass it on." And he tries.

Having trimmed his long hair and beard since the last Jay Kay Klein portrait, Larry had the up-to-date picture here taken by daughter Mary Elizabeth who at eight is a child prodigy of the camera. Fortunately for my self-esteem, his son Seth Adam at age three has not yet learned to focus properly.

Appearing from ACE Books about the time you read this is the newest Janifer novel Knave in Hand, *a sequel to* Survivor.

● *As a group, science fiction writers have held every conceivable job. Laurence Mark Janifer is the fraternity's carnival fire-eater and barker. He also had more mundane jobs including tailor's assistant, professional pianist and arranger, MC, comic, actor, producer, stagehand, editor, and literary agent.*

Larry started writing at 13 when he became a life-long fan, selling his first science fiction story in 1953, and his first to Analog *for the May, 1959 issue. Back then the magazine was known as* Astounding *and the writer as Larry M. Harris. That family name had been acquired by accident when his grandfather arrived at Ellis Island. Larry researched the original Janifer name and has used it ever since, except for the 30 pen names helping to account for over 35 books and nearly 500 magazine pieces. His most famous* nom de plume *is Mark Phillips, which denotes a collaboration with Randall Garrett.*

He was born in New York City and has lived there continuously except for eleven regretted months in a small town. Since then, he has hardly been further than 45 minutes from Broadway at any time. A graduate of the High School of Music and Art, he tried CCNY for the better part of a year, but left for a better education at home with a diversity of books. He is now learned in particle physics, microphysics, astrophysics, mathematics, Latin, German music, and history.

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"The System has worse problems right now."

"With Earth dead, you people in the artificial worlds are *finished*," she said savagely, a spark returning. "That's why we left. We could see it coming."

Nagara wondered if they'd have left at all if they'd known a faster than light drive would come along. But no, it wouldn't have made any difference. The translight transition cost too much and only worked for small ships. He narrowed his eyes and made a smile without humor.

"I know quite well why you left. A bunch of scum-lovers. Purists. Said Earth was just as bad as the cylinder cities, all artificial, all controlled. Yeah, I know. You flatties sold off everything you had and built *this*—" His voice became bitter. "Ransacked a fortune—*my* fortune."

For once she looked genuinely curious, uncalculating. "Yours?"

He flicked a glance at her and then back at Zak. "Yeah. I would've inherited some of your billions you made out of those smelting patents."

"You—"

"I'm one of your great-grandsons."

Her face changed. "No."

"It's true. Stuffing the money into this clunker made all your descendants have to bust ass for a living. And it's not so easy these days."

"I . . . didn't . . ."

He waved her into silence. "I knew you were one of the mainstays, one of the rich Flatlanders. The family talked about it a lot. We're not doing so well now. Not as well as you did, not by a thousandth. I thought that would mean you'd get to sleep right through, wake up at Tau Ceti. Instead—" he laughed—"they've got you standing watch."

"Someone has to be the Revealer of the word, grandson."

"Great-grandson. Revealer? If you'd 'revealed' a little common sense to that kid over there, he would've been alert and I wouldn't be in here."

She frowned and watched Zak, who was awkwardly shifting the squat modular canisters stenciled GENETIC BANK. MAX SECURITY. "We are not military types," she replied.

Nagara grinned. "Right. I was looking through the family records and I thought up this job. I figured you for an easy setup. A max of three or four on duty, considering the size of the life-support systems and redundancies. So I got the venture capital together for a translight and here I am."

"We're not your kind. Why can't you give us a chance, grandson?"

"I'm a businessman."

She had a dry, rasping laugh. "A few centuries ago everybody thought space colonies would be the final answer. Get off the stinking old Earth and everything's solved. Athens in the sky. But look at you—a paid assassin. A 'businessman.' You're no grandson of *mine*."

"Old ideas." He watched Zak.

"Don't you see it? The colony environments aren't a social advance. You need discipline to keep life-support

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activated. Communication and travel have to be regulated for simple safety. So you don't get democracies, you get strong men. And then they turned on *us*—on Earth."

"You were out of date," he said casually, not paying much attention.

"Do you ever read any history?"

"No." He knew this was part of her spiel—he'd seen it on a fax from a century ago—but he let her go on to keep her occupied. Talkers never acted when they could talk.

"They turned Earth into a handy preserve. The Berbers and Normans had it the same way a thousand years ago. They were seafarers. They depopulated Europe's coastline by raids, taking what or who they wanted. You did the same to us, from orbit, using solar lasers. But to—"

"Enough," Nagara said. He checked the long bore of the axial tube. It was empty. Zak had the stuff secured on the carrier. There wasn't any point in staying here any longer than necessary.

"Let's go," he said.

"One more thing," the woman said.

"What?"

"We went peacefully, I want you to remember that. We have no defenses."

"Yeah," Nagara said impatiently.

"But we have huge energies at our disposal. The scoop fields funnel an enormous flux of relativistic particles. We could've temporarily altered the magnetic multipolar fields and burned your sort to death."

"But you didn't."

"No, we didn't. But remember that."

Nagara shrugged. Zak was floating by the carrier ready to take orders, looking tired. The kid had been easy to take, too easy for him to take any pride in doing it. Nagara liked an even match. He didn't even mind losing if it was to somebody he could respect. Zak wasn't in that league, though.

"Let's go," he said.

The loading took time but he covered Zak on every step and there were no problems. When he cast off from *Redeemer* he looked around by reflex for a planet to sight on, relaxing now, and it struck him that he was more alone than he had ever been, the stars scattered like oily jewels on velvet were the nearest destination he could have. That woman in *Redeemer* had lived with this for years. He looked at the endless long night out here, felt it as a shadow that passed through his mind, and then he punched in instructions and *Redeemer* dropped away, its blue-water arc a fuzzy blade that cut the darkness, and he slipped with a hollow clapping sound into translight.

He was three hours from his drop-out point when one of the canisters strapped down behind the pilot's couch gave a warning buzz from thermal overload. It popped open.

Nagara twisted around and fumbled with the latches. He could pull the top two access drawers a little way out and when he did he saw that inside there

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was a store of medical supplies. Boxes and tubes and fluid cubes. Cheap stuff. No DNA manifolds.

Nagara sat and stared at the complete blankness outside. *We could've temporarily altered the magnetic multipolar fields and burned your sort to death,* she had said. *Remember that.*

If he went back she would be ready. They could rig some kind of aft sensor and focus the ramscoop fields on him when he came tunneling in through the flux. Fry him good.

They must have planned it all from the first. Something about it, about the way she'd looked, told him it had been the old woman's idea.

The risky part of it had been the business with Jacob. That didn't make sense. But maybe she'd known Jacob would try something and since she couldn't do anything about it she used it. Used it to relax him, make him think the touchy part of the job was done so that he didn't think to check inside the stenciled canisters.

He looked at the medical supplies. Seventy-three years ago the woman had known they couldn't protect themselves from what they didn't know, ships that hadn't been invented yet. So on her five year watch she had arranged a dodge that would work even if some System ship caught up to them. Now the Flatlanders knew what to defend against.

He sat and looked out at the blankness and thought about that.

When he popped out into System space the A47 sphere was hanging up to the left at precisely the relative coordinates and distance he'd left it.

A47 was big and inside there were three men waiting to divide up and classify and market the genotypes. When he told them what was in the canisters it would all be over, his money gone and theirs and no hope of his getting a stake again. And maybe worse than that. Maybe a lot worse.

He squinted at A47 as he came in for rendezvous. It looked different. Some of the third quadrant damage from the war wasn't repaired yet. The skin that had gleamed once was smudged now and twisted gray girders stuck out of the ports. It looked pretty beat up. It was the best high-tech fortress they had and A47 had made the whole difference in the war. It broke the African shield by itself. But now it didn't look like so much. All the dots of light orbiting in the distance were pretty nearly the same or worse and now they were all that was left in the system.

Nagara turned his ship about to vector on the landing bay, listening to the rumble as the engines cut in. The console phosphors rippled blue, green, yellow as Central reffed him.

This next part was going to be pretty bad. Damned bad. And out there his great-grandmother was on the way still, somebody he could respect now, and for the first time he thought the Flatlanders probably were going to make it. In the darkness of the cabin something about the thought made him smile. ■

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anlab

As many of you know, Analog used to have a monthly feature called the Analytical Laboratory. Each month, readers sent in a postcard or letter listing the stories in each issue in their order of preference. The results were tabulated, and the authors of the first and second most popular stories, according to the poll, received bonuses of 1¢ and ½¢ per word, respectively. The system had a lot of merit, I think—as long as enough readers voted to make the results statistically significant. Unfortunately, they didn't, and a couple of years ago the Analytical Laboratory (or An Lab) was dropped and the money formerly used for merit bonuses applied to higher pay rates for regular contributors.

Many readers pointed out that reader evaluation of stories was still a useful thing, and last year an *annual* An Lab poll was taken, with readers rating their favorite stories from all of 1977. We'd like to try another; we already have some votes in, but a reminder appears in order.

Here's what we'd like you to do. Drop us a line listing, in each category (serial, novelette, short story, article) your three favorites from all issues dated 1978. List them in order—first choice first, second choice second, third choice third. We'll tabulate the results and—if we get enough —let you know how they came out. We're doing this a bit late, so please get your votes in as soon as possible. (Please send your votes to: An Lab, Analog, 350 Madison Ave. NY NY 10017)

One more thing. I'd like to investigate the possibility of trying the monthly An Lab again—if there's enough reader interest. How do you feel about it?

More to the point, would *you* vote—regularly?

THE EDITOR

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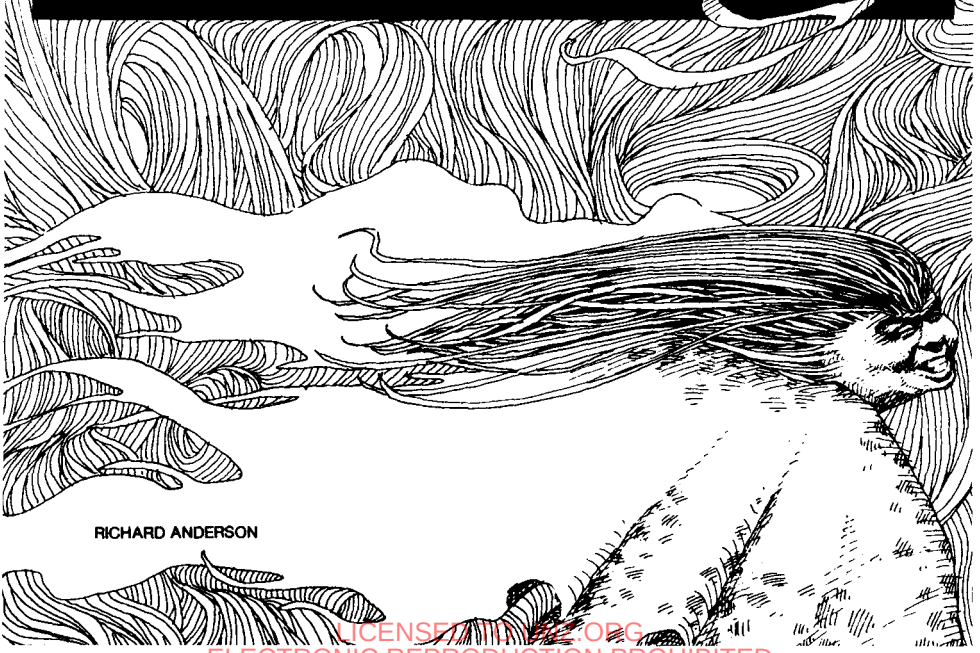
THE THIRTEENTH UTOPIA

If a utopia really existed,
would human beings be able to bear it?

SOMTOW SUCHARITKUL



RICHARD ANDERSON

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He came to Shtoma in the cadent lightfall, his tachyon bubble breaching the gilt-fringed incandescent clouds like a dark meteor.

Some feelings are never unlearned. Some wonders never fade with experience. So he reflected, Ton Davaryush, master iconoclast, purger of planets, transformer of societies. Especially one: the thrill of power, of potentiality . . . of a virgin utopia, ripe for the unmasking of its purifying flaw.

Every utopia has its flaw. Ton Davaryush wished it were not so. He was sad—but only for a moment—that he must wreak havoc on this planet, even though it lay at the very limits of the Dispersal of Man; but he had learned not to compromise. With the destruction of twelve deceptive utopias, experience had at least banished misgivings. For Davaryush was two hundred and thirteen years old, and at the height of his analytic powers.

He closed his curiously heavy-lidded eyes to the shimmering of the cloud-banks and the extravagance of the alien landscape that grew constantly as he fell, with its strange sharp-angled trees like gigantic pink spiders, their photosynthesizing pigment having a ferric, not a magnesium base, and its whimsical spiral dwellings of transparent plastic, jutting up at irregular intervals from the blanket of dense vegetation, crimsons and vermilions. He ignored them, and the savage thrashings of the wind as his translucent sphere automatically adjusted to the gravity, softening his fall for landing on Shtoma.

And thought of the covenant: *for the breaking of joy is the beginning of wisdom.* And thought, pathetically: I, Ton Davaryush, expelled from the mainstream of human society by time dilations and the gulfs of space, am too alone. He tried to bury himself—eyes still closed to the atmospheric turmoil—in analyses of what he had been told about this world. How they had fallen into a pattern, an ecological stasis, from which he must release them, whatever the cost. And this was no backward, back-to-nature primitivistic planet, exulting in its own self-conscious apartness and ignorance, but a world whose technical sophistication rivalled his own; exceeded it, in at least one respect, for Shtoma alone, in the entire Dispersal of Man, knew the secret of gravity control. For which they had no use, except for the manufacture of toys. And which they guarded with such miserliness and irrational fervor as to belie their much-vaunted saintliness, their notorious lack of greed and every other human quality. And the rumor that Shtoma was a utopia was more than could be tolerated.

If it was a utopia it could be destroyed. This he knew. He understood every facet of the utopian heresy. He was a master iconoclast, dedicated to the perpetuation of change. *Every utopia has its flaw.* He clutched this knowledge to him like a secret prayer.

I may be a saviour.

He opened his eyes finally. And saw the incredible wildness, the intractable

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angularity of the landscape, the lurid carmines and scarlets of the trees that lurched toward him with their arachnoid arms outstretched. His bubble slowed itself, gradually, to bring him to the field of rust-colored grass. Alien buzzings and high-pitched song-snatches assailed his ears.

He deactivated his tachyon bubble with a flick of his mind—the keys were cybernetically brain-implanted—and was now at the mercy of the alien environment. At some indeterminate future, he would be rescued—when the computer on homeworld decided.

I may be a saviour. This was more important to him than why they had jealously hidden their secret from a galaxy where knowledge was not for concealing, why they had not used their secret for conquest, as was their right. But this would come. *I am bringing them their human nature,* he thought. The thrill of it lived in his heart. (For this thrill he had joined the Inquest.)

He drew his shimmercloak over his shoulder. It absorbed the fresh air and began to radiate in the safe range, as he knew it would: he stroked it softly as it blushed, pink against the aquamarine fur; wishing, as always, that it was not a dumb semi-sentient. For he was alone.

Turning in the direction of the nearest habitation, he reviewed once more all he had been told about Shtoma.

A planet unaccountably close to its primary, a white dwarf, yet environmentally anomalous: Earth-sized, temperate, with the wrong atmosphere. With incredible potential for economic power, yet with no armed forces, which ignored the rest of the Dispersal of Man, the galactic authority—leading inexorably to the heretic suspicion of utopia! He began walking. It was not the Inquest's way to arrive conspicuously, gaudy with the trappings of salvation.

But then a stranger stood in his path, unmoving. An oldish man, clad severely in a brown tunic; clearly a peasant or slave. He was looking at the ground, and Davaryush had come quite close to him.

The stranger looked up at Davaryush and sang, in a clear tenor, the first alien words he had heard since his arrival, words he was to hear so many times on Shtoma:

qithe qithembara
udres a kilima shtoisti.

Davaryush signalled to his polyglot implant, then closed his eyes to see, as though inscribed on a white page before him, the words

"soul, renounce suffering;
you have danced on the face of the sun."

It appeared to be a form of greeting. But the strange words, with their opaque and patently sinful meaning, strengthened his suspicions; and he approached the stranger diffidently. There was one other thing experience never banished: fear.

Activating his implant so that it would intervene in his speech functions, he said: "I am from another world. Who may I address?"

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The alien's gaze chilled him, though it contained no malice. "You are Inquestor Davaryush, of the Clan of Ton. Welcome." Abruptly the stranger beamed and stretched out his arms to embrace Davaryush. The Inquestor yielded ungracefully. He had misjudged; this was no peasant. "We were expecting you."

"Yes. I come to investigate Shtoma's utopian possibilities, so that it may be considered for the honour of being named a Human Sanctuary." Davaryush did not blush at the lie, for it came easily to him by now.

"So! How delightful." His eyes laughed themselves into a hatchwork of wrinkles. "I am your host, Ernad. You must be weary; come."

Who was this man, poorly dressed and without a single attendant, who dared to address a Master Inquestor by name and who knew his mission? Again the alienness of the world unnerved him. The clouds had parted to reveal the white dwarf sun, unnaturally close. The rough wind tousled the grass, blood-red and tall. He started to answer Ernad, but the old man had turned, expecting Davaryush to follow him.

A stony path, pebbled with shiny stones, led to the first recognizably human artifact: a displacement plate, metallic and incongruous in the middle of the field. He was unprepared for this. He was forced to remind himself that this was no primitive world—in spite of the absence of war or, apparently, slavery. "When can I begin my investigation? The Inquest must know soon, in time for the Grand Convocation," he said.

Ernad beckoned Davaryush onto the plate. "Frankly, we have so little involvement with the worlds outside—" he began, then stopped himself. "Well, as you wish; whenever you wish." Davaryush was suspicious of the warmth in his voice, but it appeared convincing. Clearly he was dealing with a master of ambiguity. But the impropriety and unashamedness of "little involvement" compounded his bewilderment.

They materialized in what appeared to be one of the structures he had glimpsed during the landing.

He reeled with the vertigo of it—the crazy swirlings and spirallings of transparent walls, the cacophony of chimings and chirpings that bombarded his senses. How could they live amid such a wilderness of sensual stimuli? Where was their discipline, their culture? A woman nearly ran into him, then trotted away, laughing, children and young people sauntered by, gaily calling out "*qithe qithembara; udres a kilima shtoisti*!" completely without respect. "You must forgive them," said Ernad, interrupting his dismay. "You are an off-worlder, and . . . well, it is especially exciting for them now. It is almost time for the festival of Initiation, and anything can spark their enthusiasm." He said this matter-of-factly, with no trace of criticism in his voice, again pointing up his alienness.

"They are your attendants?" Surely someone important enough to be his

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host would have servants of a kind.

"No; neighbours, relatives, friends. My house is theirs."

But Davaryush was thinking: what of the initiation ceremony? Perhaps that was the flaw. Perhaps there was some unspeakable rite, some trauma they were all forced to go through . . . perhaps this would be the handle he could use to save this misguided people.

"Ernad, I must rest," he said. "But after, I would see everything on your world: your games, your pleasures, your prisons, your criminals, your asylums, your places of execution."

"Ah. Yes, I have heard of madmen and criminals. I am not uneducated, Inquestor Ton," replied Ernad mysteriously. They turned down a corridor of glass that swerved upwards into the air, and Davaryush felt a sudden dislocation, as though he had changed weight or *down* had become sideways, and he found they were walking upside down, on the ceiling. "What is happening?"

Ernad laughed mildly. "It is the same principle, you know, as the varigrav coasters. You must have seen them, our principal export—"

"But why fool around with gravity inside your dwellings?"

"Why not? Would you not be bored, if all directions remained constantly the same . . .?"

Up became *down* again. They reached a large chamber that seemed to be perched, precariously, on the point of a translucent pyramid in the sky. "Your resting place. It is my own chamber, Inquestor; I trust you will find it comfortable."

Davaryush's eye alighted on the only adornment of the room, apart from the resting-pad. It was a huge, capelike sheet of some sheer material that hung on one wall, like a rainbow sail, rippling softly in the ventilating breeze. It was beautiful, he conceded, but bewilderingly complex, uncivilized. "This cape? What is it for?"

"Oh. My wings," Ernad said.

Davaryush knew then how addicted they must be to the varigrav coasters, those toys they had inflicted on the rest of the galaxy. And he looked at the old man, who seemed utterly ingenuous, and wondered if it were possible that this sincerity were not, after all, the product of a trained deviousness, but merely a product of his lower mentality.

For here was a toy, hanging on the wall as though it were a god.

"Leave me, Ernad," he said brusquely.

He was trying to establish authority, the distancing proper for an Inquestor. He needed to preserve his mask of sternness, for he was already sad. He was vulnerable, he realized, even after twelve successful missions.

For he was nothing if not compassionate.

You have compassion, Davaryush.

"Yes, Father." He was twelve years old, veteran of three wars, and now an initiate. And alone, in the small room, with the Inquestor, whose eyes glared fire and millennial wisdom. Now after

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more than two centuries, the scene returned, vivid.

When you came to kill the condemned criminal, you did not torture him or play with him, as was your right, an essential part of the initiation. You killed him cleanly, in a matter of seconds, slicing him into two congruent parts with your energizer. It was artistically done. But why?

"Father, it was necessary to show skill, not cruelty. I have already killed many people." He feigned an assurance that was far from his true feelings.

Very well. I name you to the Clan of Ton.

Davaryush started, gasped audibly despite his knowledge of proper conduct . . . he had come expecting to fail, to be returned to homeworld. The Clan of Ton . . . that would mean seminary, long lonely years on harsh, inhospitable planets, unwelcome, thankless labour for the sake of pure altruism. "Father—"

You are unworthy. I know. Nevertheless, the Inquest takes what it can get.

His first mission was the planet Gom, a hot planet of a blue-white star. The people lived in tall buildings, thousands to a building, fifteen billion to the planet. But they were happy. They were quite ignorant of their responsibilities as a fallen race; reliant on automata, they pursued their hedonistic existence without regard for their true natures. They suffered from the heresy of utopia.

He remembered how he found the flaw to that utopia. Every year, in a special ceremony marked by compulsive gratifications of the senses, all those over the age of fifty intoxicated themselves and then committed suicide, leaping by thousands into the volcanic lava lakes that boiled ubiquitously on every continent.

He had saved them. Whispering to only one or two: *and what if you did not die?* he had created civil wars, revolutions, unhappiness. People ran mad, setting fire to the machines that had succored them. Then the ships of the Inquest came, bringing comfort with them, comfort and truth.

But the happiness had tempted him. *Remember, man is a fallen creature, Davaryush. Utopias exist only in the mind, a state to which it is given us to aspire. But to imagine we have attained that state—that is to deny life. The breaking of joy is the beginning of wisdom.*

Now he was no longer tempted. For he had seen such as the planet Elderelddad, where the happy ones feasted on their own children, which they produced in great litters, by hormonal stimulation; and the planet Xurdeg, his most recent mission, where the people smiled constantly, irritatingly, showing no face except the face of rapt ecstasy, until he finally learned that the penalty for grief was dismemberment, to feed the hungry demands of the degenerating bodies of five-thousand-year-old patriarchs . . . yet when he had asked one of these ancients, what he most desired, he had replied:

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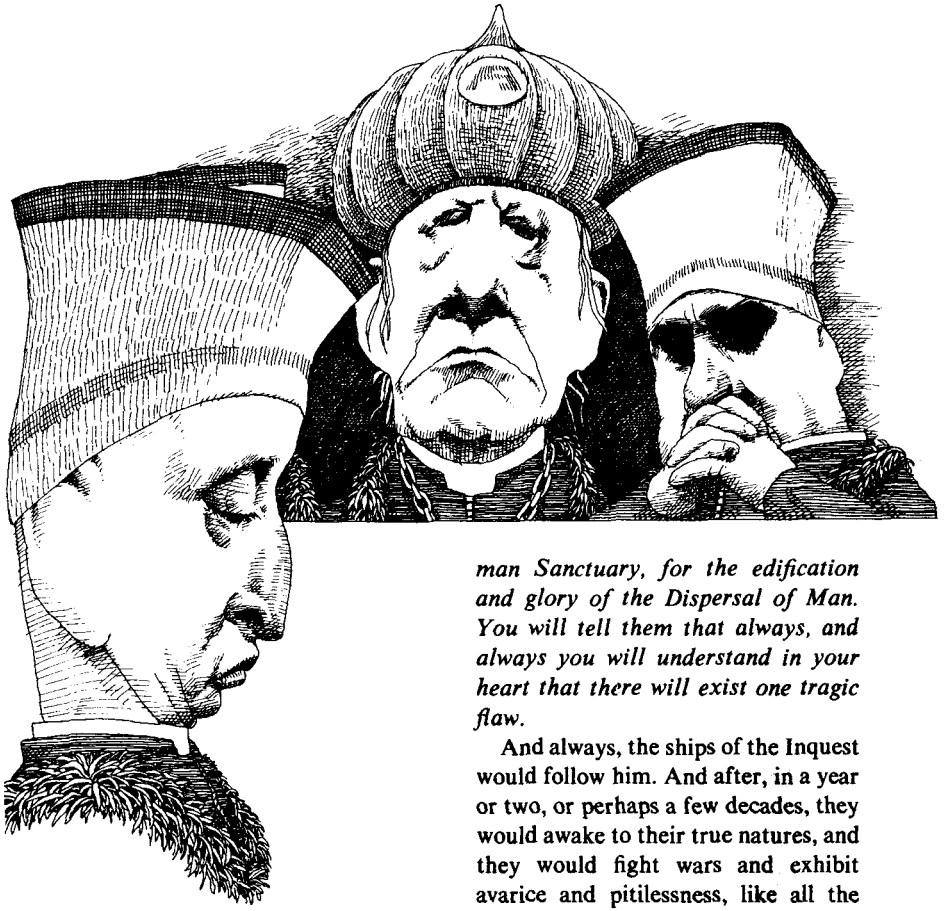

To feel grief. But I am afraid to die for it.

Ton Alakamathdes, Grand Inquestor of his Sector, who had watched his initiation and had chosen him out for the Clan of Ton, had said to him that day when he was a young boy facing his new destiny: *Never forget the lie. This lie is the sacrifice that you must make, the little sin that you must commit, for the sake of saving countless millions. The lie is this: the Inquest is seeking a perfect utopia, a planet that will be designated a Human Sanctuary, for the edification and glory of the Dispersal of Man. You will tell them that always, and always you will understand in your heart that there will exist one tragic flaw.*

And always, the ships of the Inquest would follow him. And after, in a year or two, or perhaps a few decades, they would awake to their true natures, and they would fight wars and exhibit avarice and pitilessness, like all the other worlds. Man is a fallen being.

Remember: you are a guardian of the human condition. He felt the eyes of Ton Alkamathdes on him, even two centuries away and countless parsecs, boring into his soul, purifying him; and in their sternness he drew a kind of comfort. But then he awoke, long before dawn, and was on Shtoma and frighteningly alone, exposed to the alien sky under the structures of glass and clear plastics. He found a young girl singing to him, "qithe qithembara, Lord Inquestor."

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He sat up abruptly, reaching for a nonexistent weapon. "Who are you?"

"I am Alk, daughter of Ernad." (The voice haunted his thoughts for many days, reminding him of the whispering sea on homeworld.) "Will you be pleased with me? Of all the children who saw you, I was most taken by you, Inquestor."

They were depraved, shockingly amoral! They sent their own children to sleep with strangers! "No!" he cried out, and the severity of his own emotion startled them both. "On our worlds we do not do things like this."

"But father said to show you our love, the love of *udara*."

Udara? (Their name for the dwarf star, their sun, whispered his polyglot implant. Again he was puzzled.)

"Leave me, please." He tried to exclude the pain from his voice. Shame flooded him. In the starlight he saw disappointment on her face, and thought: they do not even hide their emotions! what savages, what innocents! And without a further word she rose and left him, noiseless as a breeze.

Quickly he ran through what he had learnt in those few hours. They dressed severely, denying all rank and pomp and selfimportance; they made curious fetish of their wings, they were morally loose, they did not make any effort to conceal their feelings, but were like children, wholly innocent of the need for tact and diplomacy—and this last thing, the love of *udara*. That could mean anything. Every perversion, every practice of perversion was possible, because of the human condition.

And, under the strange constellations, knowing that he had no weapons and that he could not know when he would be rescued, he began to recite the first prayer he had ever learnt. Its meaning, for its language was no longer spoken, was a sublime mystery to the Inquest, but all who went through the seminary could repeat it, as a solace, in times of emotional turmoil. The nonsense words—perhaps little more than gibberish distorted by man's long history—were a kind of bond between the members of the Inquest, all solitary men: "pater noster, qui es in inferno . . ."

"But—what is *in* these black boxes? I have seen several during my stay here," Davaryush demanded of the heretic priest.

The white-bearded old man—a magnificent mottlement of wrinkles and discolorations, without the common decency of cosmetics—smiled beneficently at him. "*Udara*," he said. "*Udara* is in them.

"Will you not touch it?" the priest said, beckoning to him. The temple's black box—it was perhaps a meter square—stood in the center of the transparent hall which could have held ten thousand people without any trouble. It was the only object in the chamber. "Come, touch; you will feel *udara*."

Hesitantly, Davaryush went up to it with his hand outstretched. He felt wobbly-kneed, as though his weight

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were constantly shifting, as though he were losing control of his limbs. Gingerly, he brushed the cool metal with his fingertips.

Overwhelming joy coursed through his thoughts for a moment. He saw homeworld fleetingly, and ached for it; heard the music of the sea, saw vividly the faces of his parents, whom his own time dilation had stranded in an unreachable past . . . they smiled at him, he was a child half their height, reaching up to touch their faces, laughing . . .

And snatched away his hand as though he had been burnt. This was dangerous, clearly some powerful hallucinogenic device. He stared at his hand in terror.

The happiness he had just felt echoed in his mind. He was tempted to reach out again, and he controlled himself with tremendous difficulty, and knew he had stumbled upon one of the key clues to what was wrong with Shtoma.

They were selfdeluders, obviously, intoxicating themselves with false memories and artificially induced joys.

"Did you not feel the love of *udara*, stranger?"

"No, priest. I felt—I remembered something I thought I had lost forever." He turned to leave.

"You do not wish for more? Ah, but you have not danced on the face of the sun."

He turned again, saw the look of pity in the priest's face, the expression of *ah, but you are incapable of understanding.* So he walked hurriedly out, not bothering to acknowledge the priest's hearty "qithe qithembara."

Ernad was waiting for him, and the girl Alk, who was—by daylight—a creature of striking beauty, not in her facial features but in the way she moved and spoke; and another of Ernad's children, Eshly, a little boy of about six, who prattled and asked questions as though he were much younger, and was quite devoid of discipline. They walked on to the next displacement plate: Ernad smiling, the girl and her brother running excitedly, then lagging behind, Davaryush moody. Ernad told him more about the Shtoikitha, the people of the dance (and they called their planet Shtoma, *Danceworld.*)

"Yes, we're a very thinly populated planet, only half a million souls . . . what do we eat? There is fruit in the forests, small animals too, crustacea of fantastical shapes in the rivers; we don't have agriculture here. The fruit of the *gruyesh* falls to the ground and ripens, and when it turns mauve we tap it for the *zul*, that mildly fermented sweet juice that you drank this morning . . ."

"Crime?"

"Why should anyone commit it?" Ernad laughed gently. "We have *udara*, you see, so it isn't necessary."

"I don't understand. My polyglot implant translates that word simply as "sun"; but I have heard it in at least a dozen meanings since I came to Shtoma. I know that semantics aren't perfect, but could I be missing something? You can't tell me that your

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people, in all their evident complexity, attribute all your fortunes to some mythical property of your sun!"

Davaryush was exasperated now. It was becoming a strain to maintain his investigator's pose. Clearly the problem on this planet had to do with some fundamental misunderstanding of the workings of the universe.

They had come to a small clearing, having vanished and rematerialized several times: it was level, dotted with pink shrubs . . . the two children, or rather the young woman and the boy, had run forward, breathless, and had collapsed, exhausted, on the grass . . . *by now, they would both be warriors, in the real world,* he thought. How sad, that they were trapped in a permanent preadolescence.

The boy he felt compassion for: he was like a retarded child who is nevertheless extremely beautiful. But Ernad was talking again.

"Still you don't see, you don't comprehend the elegant simplicity of it. Relax! Feel the singing in the sky: one cannot commit evil here."

He tried to feel, sensing, in the absurdity of the old man's beliefs, some core of faith that he would never be able to alter . . . the soft sussurant rustlings of the red forests sang to him, but in their singing was mingled, chillingly, an image of homeworld . . . he tensed, instinctively, knowing he was playing with fire.

"Have you ever ridden a varigrav coaster?"

"No!" The thought horrified him. Abandonment to the senses, to utter helplessness! Never would he . . .

"It is a pity. What *did* you feel, when I asked you to listen to the music of *udara*?"

(Again, some obscure semantic twist.) "I don't know. A memory. It doesn't matter."

"On the contrary; it probably *does* matter. But you will learn at the initiation ceremony, perhaps."

"I am to take part?" Nothing would induce him to take part in any barbarian rite! Why, he might be mutilated, he might have to watch some unspeakable evil . . . but Ernad smiled the smile that excluded him from those who understood, frustrating him even more. "*Udara* is the key to what you are searching for, you know. Without it, this world would surely not be the paradise it has become."

"Why, that's ridiculous."

The two children of his host had come up and were watching him intently. "Father," said the boy Eshly, "don't be hard on the poor man."

He was so naive, so tactless, so ignorant! But Alk only looked at him, knowing what had passed between them in the night. (He knew now that no stigma was attached to sexual promiscuity; an expression of affection, nothing more. Finally, he had had to concede that this in itself was no flaw.

"I must show you—" Ernad began.

"Take him to the nearest varigrav coaster, *please*, Father," Eshly cried urgently. He clasped Davaryush's hand—such presumption in a stripling, such undeserved trust—and pro-

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pelled him towards the nearest displacement plate.

And in an instant they were at the edge of a cliff, sheer and blindingly white, that stretched perhaps half a kilometer down to a cleared and endless plain, without the pink of vegetation. The plate where they had arrived stood in the shadow of a tremendously tall column of the transparent building material they used. It was slender—the width of a few men, and it reached up to vanish somewhere in the vague loftiness of the clouds that hid *Udara* from view then. This was nothing like the varigrav coasters he had seen, children's pleasure things. This was overpoweringly stark, and huge; a quasi-religious luminousness emanated from it. Its vastness distorted the scale of everything, so he felt a crazy disorientation, while the two children, in nonchalant irreverance, were pushing him to the other side, shouting at him to hurry.

"Quick, come, Inquestor!" shouted Eshly. A lift platform was descending for them. Turning to watch the sky beyond the cliff, Davaryush saw black dots and smudges, microscopic in the expanse of sky and white plain, and he knew what they were. An ancient fear petrified him, he was like a robot as they buckled him in to the elevator. Suddenly, with a wild jerk, they were aloft, racing up to the starting point in the clouds, and the rushing blood in his brain crashed against the rushing of the mad winds. He was nauseous; he closed his eyes and muttered his ancient prayer, longing for an end.

At the top there was a sort of control room, diving platforms of various sizes, racks where sets of wings were set out, not the rainbow-colored type that adorned his resting-room, but plain ones, black or gray. Alk and Eshly each seized a set of wings and had run to the platforms and leapt off the edge while Davaryush fought a wild impulse to go to their rescue.

He saw them in the air, falling, falling with dizzying speed, and soon they had vanished—and then he saw them again, flung violently upward by the interplay of differing gravity fields, screeching with delight as the varigravs hurled them into turbulent whirlpools, and the wind, which was pulled in so many different directions that it was a distended, distorted tornado blasting his ears. He found himself clutching the railings in terror, he who had seen nine wars.

But the squeals of pleasure became fainter. The two became blacks dots, joining the rapidly shifting patterns of swirling specks in the distance. It was more tolerable to look at, pretty patterns against the sky, but when he thought about what was happening to them (gravity fields wrenching them in different directions, stretching their bodies' tolerance to its very limits, how could anyone find it pleasurable?) he—

"Please, take me out of this."

"As you wish."

They went into the control room. They shut out the roaring of the winds and the silence shocked him for a moment, before he gathered his ana-

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lytic senses enough to look around him . . . it was an empty room, like all the others he had seen on Shtoma, domed in the standard material, so that *udara* shone relentlessly inside, with a half-dozen of the black boxes predictably scattered, haphazardly, across the floor.

"I'm impressed." Davaryush tried to sound sincere. "How does it all work, incidentally?" He laboured a little over the casual tone of this question, since finding out the secret would make a great difference to the other civilized worlds.

"The scientific principle, or the technical aspects?" Davaryush was startled for a moment by the man's willingness to reveal.

"Both."

"Well, you know as well as I do that gravity control works by selective graviton exchange . . . the coaster also manufactures antigravitons, which exist of course only with some difficulty under normal conditions."

"But how *do* you manufacture antigravitons?" Davaryush was excited; uncautiously he let it slip through, was not devious enough in asking the question. Ernad seemed not to be aware of such things.

"I'm simply not a scientist," he said—he did not sound at all as if he was trying to put Davaryush off—"and in any case *udara* controls details like that." He pointed happily to the boxes.

Again the evasive tactics, the semantic deceptions! If the people of Shtoma were able to lie with such easy naturalness, perhaps Shtoma had never been a logical candidate for utopiahood. Perhaps his journey had been wasted.

But the Grand Inquestor had entrusted him, and the Inquest was wise.

He saw the children returning, swung upwards in a golden arc that transsected *udara* through the shimmering cloud banks . . .

"Time to go home. It will be night." Ernad motioned to his guest. "I hope you will feel more comfortable this time, and not be so afraid of the height."

The black boxes glinted in the *udara*-light. They attributed everything to those boxes, Davaryush thought. Was there something in it? Of course not. They were lying to him, creating some enormous joke at his expense.

Walking home through the ruddy terrain, Ernad told him how everybody on Shtoma participated in the initiation ceremonies every five years, almost to a man, because those who had been through it once could be renewed, purified. "You will understand everything, you know, once you have taken part—the black boxes, the *udara*-concepts. I know that you find us strange." He chuckled to himself, then added earnestly, "You will take part, won't you?"

Slowly, with the realization that he might well be falling into a trap, a trap cleverly constructed upon his own curiosity and on the necessities of his mission, he said: "I have no choice." For his mission was to understand, and after understanding to control. Even

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now, compassion touched him, more than ever before.

The accident happened.

Eshly, the boy, had run on ahead to the next displacement plate. He tripped and stumbled, face down, and the power surged. They were upon him, the resounding clang echoing in the woods. The three of them knelt down by the plate.

He lay like a discarded toy. The displacement field had aborted—it was an accident that practically never occurred, was almost unthinkable—and had wrenched half his body away and then slung it back in a nanosecond, so that he was in one piece, but impossibly bent.

Davaryush waited for the tears, for the signs of grief. But the only sighing was the breeze and the voices of the alien forest. Lightfall was ending.

"Go on, Alk," Ernad whispered to his daughter, "the others will want to know." His voice was icy calm.

Davaryush stood to follow as he lifted up the corpse, which seemed merely asleep until one saw the inhuman angle of the arms, and carried it into the encroaching forest, and returned without it, with the red shadows darkening him. There seemed to be no sadness in his face. Indeed, he almost smiled. Was this some incredible fortitude, even in the face of an impossible tragedy? Davaryush devoured the man with his eyes, seeking some clue to his emotions. And he thought: *I have found the flaw.*

And now it was time to plant the doubt, because the lowest point in a man's being is also the beginning of his ascent. Davaryush thought bitterly: here is a people that blithely throws the bodies of its sons into the forests to rot, that has forgotten grief, that does not value human life at all. Here was the flaw.

Davaryush tried to put a lot of anger into his voice, to exclude compassion while not striving too much for an oracular effect: "You don't care about your child," he said. "Love is not part of your utopia, is it? Humanity is what you have abandoned, isn't it?" *Now you are going to break down. Now your repressed humanity will come rushing to the surface.* It had happened twelve times before, and countless other times with our Inquestors.

Ernad did not collapse. He stared at Ernad with unmitigated pity.

"Of course I grieve for him. I am desolate, Davaryush. But you do not understand our perspectives, or our overview of life. With renewal my grief will be cleansed. And I grieve for him most, that he did not live to dance on the face of the sun."

And Davaryush knew that he had understood nothing at all, nothing. Never had he felt so palpably the alienness of this world, the total incommunicableness of it. His mind whirled in a wild kaleidoscope of images: strange winds, blood-crimson forests with spider arms, flagrantly immodest buildings open to the elements, a dead child unmourned, a dead child who had been playing games amidst the incomprehensible forces of black boxes that manipulated

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gravity fields . . . and this strange man's face, which should be racked with sorrow, yet insulted him with an unwanted pity. *I wish I could kill him.*

The death-impulse rose in him, a monster of the subconscious, and he suppressed it with a superhuman effort. *He is a product of his misguided culture, not to be blamed,* he reminded himself. *I have come to save him; I must never forget that; even if I cause his death, I come as a saviour.*

He had miscalculated again. Thinking to elicit from the stranger his hidden guilt, his dormant human responses, he had instead forced his own desire to kill to the surface. This desire should long have been dead, since he had renounced it for the sake of the salvation of the Dispersal of Man; yet it haunted him still, a specter from the buried past. Perhaps the will of the man was stronger than his . . .

At last he found he could feel a bond between himself and the alien, in this moment of deepest misunderstanding. For they were both men, both fallen beings.

"Ernad," said Davaryush, "I pity you." The two of them walked, through the miscoloured landscape, up to the twisted house.

Asleep that night, he was nine years old, celebrating the end of his first war.

And they came to Alykh, the pleasure planet. He and Tymyon and Ayulla and Kyg and the other companions, lost themselves in the cacophony of the crowds.

"Wait till you see *this*!" Kyg shouted, and she leapt on to the plate like a cat. They disappeared—

And Davaryush saw it, a topless tower of brick and stone and concrete and plastic and sparkling amethysts, studding the walls like jewelled knuckle-dusters . . .

"What *is* it?"

"Daavye, don't you know *anything*?" Tymyon cackled offensively.

Kyg said, with mock primness: "It's a . . . VARIGRAV COASTER!"

The tower glinted oddly, catching the sunset. "Look," said Kyg impatiently, "you dive off the top, you see, and it sets into action a series of random gravity-field interferences, and you plummet like a hawk and you float upward and you swing dangerously and you curve and then you land where you started, like a feather."

("It's beautiful," whispered Ayulla the silent.)

"Well, let's GO!" Tymyon and Kyg raced each other to the tower, and the crowds were everywhere, aliens, child-warriors brandishing their weapons, pimps, crusader-flagellants, Inquestors and their retinues, slave-hunters, veiled Whispershadows from the borders of the Dispersal, dirty children strumming on dreamharps, dissonant alien musics, and an itinerant space opera howling full-blast through amplification jewels, and Davaryush was spellbound, unmoving.

He had never . . .

The tower held him.

And the little specks that were peo-

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ple, dust-motes in the violet sunset.

"Aren't you coming?" Ayulla's voice was almost lost in the confusion.

"No." He was petrified.

"Come *on*! They're all the rage now, all the way from Shtoma you know, from the limits of the Dispersal . . ."

"No! No!" (It was said that the greatest thrill, when you fell, was the very certainty of death, suddenly averted by a twist of the field. At the moment of inevitable doom, it was said, you felt so *alive*.)

Ayulla was laughing at him. "How many people have you killed, Daavye? How can you be so scared of *life*?"

(He was ashamed. He resolved, then, to change his circle of friends.)

Now wake up. Face the hostile planet.

He moved, murmuring "Homeworld."

Shrill cries of children awakened him. And then Alk was at the entrance to his room: "Initiation, Inquestor; hurry."

He threw on his shimmercloak. It tightened around him, sensing his need for warmth, though it was not cold.

The wings on the walls had gone.

The whole family, a dozen or more of them, trooped without ceremony into his room, heady exhiliration in their faces. Quickly he followed them outside, struggling to keep up with them. His heart had sunk when he saw that the wings had vanished. For he had an inkling, now, of what this rite must involve, and it terrified him.

Many displacements later, they were on a mountain top overlooking a vast plain that glittered silver-gray with a thousand spaceships. The ships littered the fields, end to end so that the red grass was quite covered, all the way to the horizon . . . he could not imagine what they were for. Shtoma had hardly any commerce with other worlds.

"Isn't it breathtaking?" Alk grasped his arm, and he felt himself shivering . . .

"How many of them *are* there, Ernad?" he said, wonderingly. This ceremony involved a journey, it seemed; perhaps on some satellite, some other planet.

The children were dancing and tugging at him and hollering in circles round him, and Ernad did not seem disposed to answer his questions. "Come," he said, and after another displacement they were at the entrance to a ship. (It was much as he knew them; ships did not differ much, having been perfected many millennia ago, before the Dispersal.) But the number of them! And the mobs of people, their wings tucked under the arms, giggling, chattering away as they climbed into them!

In the mid-distance, some of them had already risen. They rose at even intervals, in perfect order, and he could see a long chain of them stretching into the sky, where they glittered like a jewelled necklace in the early lightfall. Quickly (almost shamefacedly) he stifled his wonder, for he

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knew he must analyse *everything*, if he was to solve the most taxing problem of his life, the enigma of Shtoma.

So he climbed the steep steps into the belly of the ship.

It was only a small cruiser, built for perhaps five hundred; there must be a thousand of them, then, to hold the whole population of Shtoma. It was impersonal, gray-walled like every ship; and it appeared to be a short-hauler, so Davaryush knew they were not going off-system. People were filing into their chambers, seeming to know exactly where they belonged; Davaryush stood stupidly for a few moments before Alk came for him, and took him to the family's cabin.

After a while, he felt the noiseless lifting of the ship.

Some time later Ernad led him to the viewroom, whose screens afforded an unobstructed three hundred and sixty degree view of space; and he saw how the line of ships trailed behind and before, each an exact distance from the other, links in a metal serpent of space . . . he asked Ernad where they were going.

"To *udara*, of course!" The old man looked blankly at him.

"Not seriously."

"Are there any other planets in this system? Any moons? We are not a mendacious people, Davaryush; perhaps that has not occurred to you yet." He spoke patiently, as though reproving a favorite child, and the attitude stung Davaryush.

He turned to see, on the other side of the room, that *udara* had swollen and was a blindingly white flameball against the blackness. He knew by now that when the word *udara* came up he would get nowhere; so he tried something else. The ubiquitous black boxes were everywhere; in the viewroom they were stacked neatly in the middle of the floor.

"Those *udara*-boxes: they power the ship perhaps?" he said, only half-skeptical.

Ernad laughed again, enjoying his guest's ignorance. (Again Davaryush felt a bitter hate, a death-lust, for his host). "Not at all; they are quite empty, and our spaceships work in the normal way."

After a moment, he said: "Now look, Inquestor: they are darkening the screen, or else *udara* would become unbearable."

"How can you say we are going there!"

"Just look at the face of the sun. There, look."

Udara was growing rapidly, and Davaryush saw: "There'a a black spot on the sun's surface!"

"*That's* where we are going."

The black dot was perfectly round. This was impossible. "It must be artificial!" he gasped. These people, far from being simple utopians, were capable of galaxy-dominating technological feats!

"Artificial? In a manner of speaking." Then he explained, "The dot of course is only black by comparison, obviously; when we get there it will appear white and incandescent."

The screen was cut in half! One side

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A Calendar of Upcoming Events

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29 March-1 April
AGGIECON X (Texas area SF conference) at Texas A&M University, College Station, Tex. Guest of Honor—Theodore Sturgeon, Artist Guest of Honor—Boris Vallejo, Toastmaster—Wilson Tucker. Registration $5 until 16 March, $6 thereafter. Hucksters, masquerade. Info: AggieCon, Memorial Student Center, Box 5718, College Station, TX 77844.

30 March-1 April
LUNACON '79 (New York area SF conference) at Sheraton Inn-La Guardia, N.Y.C. Writer Guest of Honor—Ron Goulart, Artist Guest of Honor—Gahan Wilson. Registration $7.50 until 15 March, $9.50 at the door. Art show, hucksters. Info: Lunacon '79, c/o Walter Cole, 1171 East 8th St, Brooklyn, NY 11230.

13-15 April
BALTICON 13 (Baltimore area SF conference) at the Hunt Valley Inn, Baltimore, Md. Registration $5 in advance, $7 at the door. Hucksters, free mimeography, etc. Info: Baltimore Science Fiction Society, P.O. Box 686, Baltimore MD 21203, attn: Edie Williams.

13-15 April
MINICON 15 (Minnesota regional SF conference) at Minneapolis, Minn. Registration $6 until 15 March 1979, $15 thereafter and at the door ($3 supporting/non-attending). Info: Minicon 15, P.O. Box 2128, Loop Station, Minneapolis, MN 55402.

23-27 August 1979
SEACON 79 (37th World Science Fiction Convention) at Metropole Hotel, Brighton, U.K. American Guest of Honour—Fritz Leiber, British Guest of Honour—Brian Aldiss, Fan Guest of Honour—Harry Bell, Toastmaster—Bob Shaw. Registration $7.50 (supporting) to 31 December 1978 $15 (attending) to 31 December 1978. Info: Seacon '79, 14 Henrietta St., London WC2E 8QJ, U.K. This is the science fiction world's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, banquet, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer.

ANTHONY R. LEWIS

*Items for the Calendar should be sent to the Editorial Offices, **four months** in advance of the issue in which you want the item to appear.*

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was completely black, the other painfully bright, and there were white flame-tongues that shot up, a hundred kilometers high. They were approaching the sun's atmosphere; in its heart, Davaryush knew, matter was packed into inconceivable density.

"And now . . . there are tablets you must take, since you will not be able to breathe for a few hours; they will release oxygen into your bloodstream."

"What do you mean?"

"You're going to jump into the sun."

Davaryush understood now. They had led him on, and all the time were preparing this elaborate fiery execution. I'll vaporize instantly!" he said.

"You don't understand, do you?" Ernad countered with surprising vehemence. "Gravity is under control, heat is under control! This is no ordinary star, this is *udara*. Every five years, we all ride on the gravity-fields here, and become clean . . ."

Davaryush's mind reeled under the impact of this revelation. The sun filled the screen completely now, unbelievably white . . . "You mean that you *built* this star? You built a *varigrav coaster* on the surface of a *sun*?"

"If only we had the technology!" Ernad smiled a little. "Why, the mind boggles. You are so close to the answer, and yet so far, so incredibly far! Well, we are all bound by the limits of our experience. It is time to live; explanations will follow."

They were in the airlock, then; waves of nausea crashed in his head, and he stood stock-still like a martyr waiting for death (which he felt himself to be) while they put the wings on him and the tittering of the children pelted his brain like painful hail-pellets—

The airlock opened!

There was whiteness, such whiteness. He shut his eyes and fell.

Fell. Fell.

His blood was burning. He was burning, he was falling into hell, plummeting helplessly into the scorchswift firebreath of the sunwind. He screamed, he thrashed his body uselessly against emptiness, he opened his eyes and the whiteness shattered his vision, the featureless whiteness, so he screamed and screamed, until he was no longer aware of his screaming.

He heard voices out of the past (Kill the criminal Daavye no I can't I can't you have compassion my son compassion man is a fallen being).

He reached the limit of his falling. And soared! And was flung upwards, upwards, on an antigraviton tide! And swerved, and fell headlong again, and swooped in tandem with a tongue of flame, and his scream was a whisper in the thunder of the wind (come on Daavye you fool it's the latest craze *no!* are you afraid of life or something Daavye Daavye?) and fell and fell (pater noster qui es in inferno) and fell . . .

And soared! And caromed into the roaring flame! And fell. And saw death, suddenly, and came face to face with himself, and knew death inti-

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mately . . . and fell (Kill the criminal Daavye compassion compassion) and fell . . .

Trust me.

Falling, the voice embraced him. The voice sang through him. The voice made him tingle like a perfect harp-string, dispelling his terror in a moment. He was a nothing touched by love.

(Memories came like endless printouts but there was one memory on the verge of crystallizing, and he was waiting for it, waiting for it to come, clear as a presence—)

The voice was like homeworld. The roaring was the whisper of the sea. He could almost see his parents again: and fell and fell and was touched by love and fell and lost consciousness, becoming one with an ineffable serenity.

"Answers! I want answers!" He woke, sweating, in the room in the twisted house. Ernad was there, and the whole family; he felt their concern, and then he broke down and sobbed violently, hopelessly.

"I think we deserve some answers too, Ton Davaryush," Ernad said softly; there was iron in his gentleness. (He heard the others whispering among themselves: "When he came back to the ship, he was in a trance, unconscious." "He's been like this for weeks.")

"Now understand this, Davaryush," said Ernad, "you are not the first Inquestor to visit our planet. And will not be the last either."

Davaryush did what he never dreamed he would do: between fits of weeping, he told them the whole story, how he had come to Shtoma to save its people from themselves, how he had been defeated, how he understood nothing now, nothing at all.

(They fed him with sweet *zul* and were so kind to him. This, too, evoked a strange wonder and respect in him; for he had wanted to betray them.)

"Well, you were promised an explanation. Listen, then: *Udara* is no ordinary star. Of course we didn't build him: that's ridiculous. But—do you know anything about the origins of sentience? Well, you know how life evolves: how certain arrangements of atoms, certain paradigms, created purely by chance interractions, you understand, becoming living beings, self-aware, sometimes . . . white dwarfs are created by incredible cataclysms, by a star going nova, dying . . . somehow, a spark of life was made, after the nova, and *udara* became self-aware. *Udara* is alive, Davaryush! and we have acquired a symbiotic relationship with him that permits us to exist in this scientifically anomalous state . . . do you follow? In the black boxes, Davaryush: pieces of the sun."

Davaryush lay back, stupefied, his thoughts fired by the incredible imagery of it.

"Did you imagine that mere people like we could create and uncreate gravitons and anti-gravitons? How much power is available, without the resources of a star? Could we make and unmake gravitational fields?

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Could we dim the sunlight on one area of the sun, so as to be unharmed by its heat? *Udara* does all this, by his own will; his knowledge of physical laws is several orders beyond our understanding. We think that he is aware of himself, not only in this four-dimensional continuum, but also in other continua."

"But with this power," Davaryush said, "with this sun to do your bidding, can't you conquer the galaxy, win wars?"

"You still don't understand! The sun does not do our bidding; the sun does all this because he *loves* us." (Davaryush remembered, suddenly, how love had touched him when he was plummeting towards death.) "You felt it in the sunlight. You would always have felt it, but you were so full of confusion and contradiction, and so many people had lied to you . . . but when you fell into the sun, when you danced on the sun's face, then you understood. You see, we can't commit evil, because, in the act of dancing—what the rest of humanity thinks of as our little children's game—we have partaken of a tiny fragment of his nature . . .

"But let me plant a doubt in your *mind*. That is what you came to do to us, isn't it? Well: what if the Inquest existed, not for salvation, but for destruction? What if its sole purpose were to perpetrate its leaders' desire for conquest, and its mouthpieces, the "Inquestors," were simply indoctrinated with pseudoreligiousness to make them more fanatical, more serviceable? . . ."

And Davaryush knew that he had lost his faith. (He wondered what answer he would give them about Shtoma. It would probably be unsatisfactory; they would undoubtedly have to send another Inquestor. But he no longer cared what the Inquest thought.)

Finally there came a day when Alk came running in to him, breathlessly: "Your tachyon bubble, it's hovering above the house!"

He stepped outside. The sun shone on him, bathing him with inexpressible joy.

Suddenly the memory came to him, the memory that was just beginning to come to him, before he became unconscious—

He was six years old. The ship was waiting to take him to the war. He was standing there with his father, by the sea shore, and his father seized him, on impulse, and threw him into the air, and he screamed for help, half-laughing, and fell for an eternity, into the arms that were for him, for protecting him, for loving him.

At last he understood the love of *udara*.

. . . But the children of the house had come and were clustered around him, making much of him, and Ernad stood at the entrance, waving to him.

"*Qithe qithembara*!" he yelled frantically, forcing back his tears—

He took one more step towards the bubble.

You have danced on the face of the sun. ■

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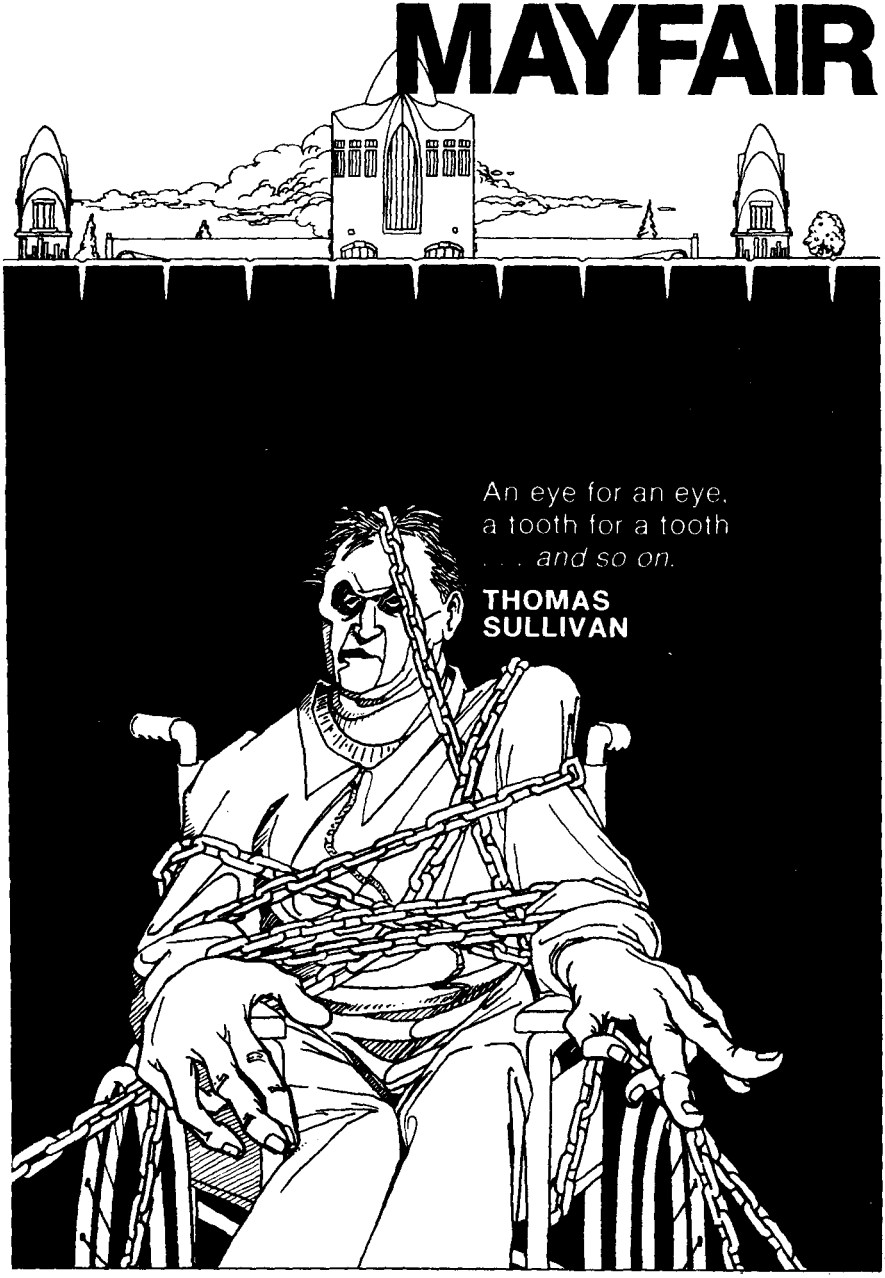
MAYFAIR



JOHN BUTTERFIELD

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I got a little money. So it wont be so bad. For awile. Only thing is what am I gonna do when it runs out? What the hell Im thirty-one. Thats too young to retire. Not to mention Ive grown accustomed to three meals a day. The dude that did it he was maybe thirty or thirty-two. Thirty-two Id say.

He thinks hes doing twenty-five to life but he aint. Seven years. At the outside I give him seven years to convince the bleeding hearts hes paid it off and become a reglar guy ready to take his place in society. Meantime, you know he aint got time on his hands like me. All those fancy rehab programs up there at Mayfair. Jeez it makes me burn. Time on his hands. What the hell does he know about time on his hands?

Hell I guess prison aint exactly a vacation. But jeez look at me. Before this hapened I worked construction ten hours a day. Strongest guy on the shift. Once I crushed Sharkeys lunch pail with my bare hands on a bet. I could walk a beam reading a paper like Mr. Magoo and never miss a step. Now sometimes I dont know up from sideways and my left arms about as useful as an empty sleeve. That dude up there at Mayfair he dont know how lucky he is. Seven years. Thats a helluva lot better than what he give me.

If I had it to do over Ida killed the bastard when I had the chance. We was all standing there watching him point the las-gun at the credit clerk. Three of us. A teenager with a shaved head and a little old lady and me. The teenager was closest he couldve jumped the dude. But he didnt. At the trial he said he was a follower of the way or something like that so I guess he didnt go around jumping dudes with las-guns. Seems to me it wouldve been a good deed if he did. And the little old lady she just stood there with her lips sewn together and her eyeballs twice as big as they oughta be through her glasses shaking like somebodyd put ice cubes in her armpits. I wouldve jumped him for sure if Id been closer. But I was standing three meters away looking at a picture of a Chevy rotor-lift on the magazine rack. Lota good it did me to keep out of it. When the dude got the credits he lased the clerk through the head and then gave me a shot cause I was between him an the door.

The hospital said I was lucky to get off with just partial paralisis seeing as how the beam touched my spine after missing everything else. Lucky. I figure the credit clerk was lucky.

Look at me writing all this down. That tells you how desparite I am. But its like getting it all out now. It was driving me nuts inside. Like steam in a boiler with the cock closed. Got to let it out. And I'm going to Mayfair. Ive thought about it a lot and Im going to Mayfair.

Well I went to Mayfair. I took the Metro-orbit to Ann Arbor and hired a cab from there. 490 credits and I didnt even get to see the warden. But Im gonna see him. Thats what the shrink said. Tomorrow he said. You might

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think he was just puting me on to calm me down. I got pretty up tight when they wouldnt let me past the gate. When I saw the place it made me mad—bitter I guess youd say. Then I see this big limosine coming out and I figured it was the warden and threw myself on the hood. Well it wasnt. It was the head shrink. After they calmed me down he said the warden was out of town. I said Id wait. I pointed at the left side of my face and shook my limp arm at him and told him the warden was the only one that could make it up to me for what that dude done. I told him the state gave me some money for it but that it was almost gone. I said Id keep coming back till the warden saw me. He looked at me strange like and I guess he felt sorry for me for being a cripple and all so he made a call from the guard house and told me to come back tomorrow. No one ever looked at me that way before. I didnt like it. When I could use both arms and was the strongest guy on the shift guys like that would do what I told them alright. But they didnt look like that. They had respect in there eyes.

After he left I walked all the way around that whole prison. Jeez what a place. It makes me puke. I could see the ball fields and some of the men. They looked like they was in school. What the hell kinda punishmint is that anyway? If thats all that can happen to you give me a las-gun and Ill go kill a credit clerk myself. What the shit.

They didnt look happy though. The men I mean. I guess its tough even though they deserve it. All the same they got jobs and classes and free medicine and all. What do I got?

Well I saw him and its all over. I mean really over. Double and triple period. Here I am in this stupid obsirvation whatdiacallit. Writing it all down again. The warden I dont know where he is and I dont care.

I guess he dont care about me neither. But I could see that from the start. I seen him yesterday morning in his office. He acted like I wasnt there for a minute. You know the way they do to show how busy they are. Well I seen paper people before so I know the type and it didnt bother me. I just looked at his walls all covered with photos and awards and stuff. I read one or two of the awards and they was for rehab stuff. Programs you know. So when he finally looked up and said what did I want I told him it was because of that. I told him how it wasnt fair that a killer should go to prison and get all the advantages while his victims that he cripled and robbed cant do nothing no more and nobody cares. I told him I paid taxes for those programs and how I thought it was a piss poor way of punishing any one but I didnt care so long as I got a chance to get rehabed myself. I told him I wanted in to Mayfair.

He looked kinda surprised at that and then he said hadnt the state given me some money credits and wasnt I eligable for other programs? I got kinda hot and I said those werent the kinda programs I wanted. Handouts. I

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told him I wanted to work. Well he went on and on about how sorry it was but that it hadnt nothing to do with Mayfair. I said it did. I said Id thought a lot about it and it did. I said I wasnt just talking for myself and all the dumb shits who live by the muscle but for anyone who gets cripled by a crime and cant work. I said there was brain damaged victims and librerians and jewlers and execs and maybe wardens too. I said if there was money for the criminal there should be money first to undo the damage he done.

Well he sorta agreed but he said if he didnt change the criminals theyd just go out and do it again. I said he was letting the crooks blackmail us. I said if there aint no sting at the end of the whip then theres no fear against doing crimes. I said everyone knows right from wrong if you make him pay his dues high enough for wrong. Its soft outs like Mayfair that makes a crook think he aint to blame for nothing and that the rest of the world owes him something.

Then he offered me a smoke but I didnt want one. He was just stalling for an answer. Then after about a minute he said that all criminals were people and that all people were criminals sometimes. I said all people didnt kill. He said no but that we couldnt be unhuman and should give people a second chance. Well the dude that lased me had a list of chances as long as my good arm and I told him so. I said to hell with crooks. When we was all safe and prisons and laws meant something then we could worry about rehabing people whod paid the price and were willing to learn. Nothing that that dude who killed the credit clerk got in the meantime could be anything but generous. If he got what he deserved hed get his spine lased. He wouldnt need a prison after that.

Well that warden he just went on talking oposite directions. How he was agreed any punishmint short of death was generous and an eye for an eye and all that so that by this time I seen he was just going to pretend to agree with me. So I asked him straight out. Are you gonna let me in to Mayfair? He said he couldnt. And then he looked at me kinda sorry the way the shrink had.

Everything just come to a stop then. I dont mean just the talking. I mean I felt Id left the floor or something. Everything I been through got in a big knot I couldnt swallow and made it hard to breathe. My head was hot and I started blubbering like a kid. Only the tears wouldnt come fast enough. Then I started shouting that Id get into Mayfair the easy way. I guess I picked up the phone on his desk and went for him. First thing I knew he was all blood and they was halling me off. Im still pretty strong with my own good arm after all.

So now Im here in the hospital and they say I done a terrible thing only they wont tell me if the wardens okay or not. I guess he aint. And I guess he was right. All peoples criminals sometimes.

What a way to get famous. It been 6

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months since the trial and they say the new laws going threw. They even named it after me. The doc says its long overdo. He says they coulda done it a long time ago because they can operate on almost anything. It was just a matter of the public liking it.

So now Im gonna get some kind of a nerve job and Ill be able to use my arm again. Doc says the part there gonna take out of that dude that lased me to fix me up is gonna leave him half paralised like me. Ill bet he screamed like hell when he heard. One good thing for him. Hes getting out as soon as hes paralised. That the way the law reads for cases like this. But I aint mad at him no more. I guess I even feel sorry for the poor bastard. It seems kinda cruel in a way. But criminals are gonna think twice from now on when they know they might have to give up part of there bodies to help the victims. Only thing that bothers me is what happens next. They still wont tell me what happened to the warden. ■

IN TIMES TO COME

Our lead story for May, with a cover by Paul Lehr, is Orson Scott Card's novelette, "The Monkeys Thought 'Twas All in Fun." It's probably safe to say this is one of the stranger alien contact stories you'll read. Try to imagine the tale of the Trojan Horse, from the Horse's point of view, and you might—just faintly—get some idea of what to expect. You might also be reminded of old sayings about gift horses, though it actually has very little to do with horses (or monkeys) of the literal type.

By contrast, we also have George Harper's "A Twice-Toed Tale," a unique piece which is all in fun—though some of its ingredients may bear a certain disquieting resemblance to reality.

Beginning next month, we try an experiment: a new regular feature growing out of numerous suggestions from readers. We've long had science fact articles, usually exploring one topic on the frontiers of science in considerable depth. What we haven't had is a science news column, regularly reporting and commenting briefly on developments sometimes too new even for our articles. "The Alternate View" will be such a column, with one added twist: we will have not one reporter, but two, both well known to readers of Analog. G. Harry Stine leads off with some words about "Biocybernetics"; his columns will alternate with those of Jerry Pournelle. Both men have access to the kinds of developments we're talking about, but their contacts and backgrounds are just different enough to bring two different viewpoints to the venture. Something like stereo vision. . .

We'll still have the regular fact articles, of course. Next month's is short but thought-provoking: Thomas A. Easton's "Twenty Years to Space," with a disturbing theory about why it will take that long for things to open up—and what has to come first.

In addition to all these things, we'll have a "State of the Art" piece by Samuel R. Delany, plus several short stories and the usual departments.

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HOW HIGH IS UP? THE NEW WORLD OF FREDERICK KANTOR

by Laurence M. Janifer

Let us consider a Box B, inhabited by an observer.

As recently as thirty years ago, it still seemed perfectly normal for an investigation in physics to begin with that box: a mind-experiment that involved, mostly, a good deal of thought, a supply of pens, ink and paper, and possibly a slide rule. Dr. Frederick W. Kantor (whose book-jacket biography lists him as "inventor and physicist," and who holds a widely scattered sheaf of patents in a variety of surprising fields), can be credited with quite a list of good deeds resulting from his agreement to write down some of his recent inquiries and their results for John Wiley & Sons (**Information Mechanics,** published last year)—but, just possibly, the most important immediate result is that he has gone out and brought back that Box B.

It is a depressingly common notion lately that, if you want to do any physics, you require urgently a quarter of a million dollars in the way of grants, a sprinkling of large accelerators of various sorts, a few cloud chambers (now bubble-chambers, and by next year the things may be filled with yarrow stalks), and virtually any amount of expensive computer time and attention. *Information Mechancis* is the single most important step forward in physics since cybernetics, and arguably since Planck introduced us all to the quantum: it will take a little time to get thoroughly heard of, but it is getting a first trickle of astonished notice already. Wait around for the flood.

And, in order to do his physics—in order to come up with the material in *Information Mechanics*—Dr. Kantor used a great many ballpoint pens, several reams of paper, and (our handy

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substitute for the slide rule) a pocket calculator. We are informed on page 149 that the calculator was Hewlett-Packard's model 65; there's a later reference to the model 67, and though the 65, I'm told, was the main instrument on hand, a few others seem to have been used—whatever, within the limits of necessity, was handy at the time. The list price of the 65 is so large, compared with the price of pens and paper, that it almost looks self-indulgent. But leave it in—one HP-65—and add everything up: you get a final cost for this work of well under $1,000.

That is, of course, $1,000 and somewhere between fifteen and thirty years of intensely careful thought. Dr. Kantor, who is thirty-five, says somewhere in the book that he began thinking about the problems with which *Information Mechanics* deals when he was about five.

And the first look into this book is an outrageous shock. Dr. Kantor has been the center of a few notable shock waves: it was the Nobel laureate (1955) Dr. Polykarp Kusch, in the days when Dr. Kantor was prowling the halls of Columbia University in search of his PhD, who told him: "you have your own way of doing physics." Long pause. "It seems to work." Dr. Kusch undoubtedly remembers the pre-quarter-of-a-million-dollar days; he probably didn't expect them to return in any large hurry, especially in the person of a large, bearded guitarist with a taste for strenuous wilderness hiking, and a disconcerting habit of showing up, no matter what the occasion, in regulation hiking gear, complete with knapsack. Even before you start prying away at the text, you have the jacket blurb to deal with, and the jacket blurb says, in its opening paragraph, that the book states:

". . . a basic theory that concisely subsumes and is independent of previous approaches. It offers fundamental new concepts for physics, astronomy, cosmology, and mathematics; a foundation for future philosophic investigations of meaning, objective reality, mind, linquistics; and new technologies."

Very well: you start girding up any and all available loins to doubt this. And you notice, damn it, that the publisher is not some "Inspirational Nonsense" house out on the West Coast, nor a simple vanity press, nor, for that matter, J. B. Lippincott. And Wiley, flatly, does not go off that sort of deep end. This publishing house has a higher, and more conservative, reputation than any other I am aware of in this country (or most others, for that matter); the claims made about a hard-science book, by this publisher, have about the effect of a rave review of somebody's latest porno sleaze, signed by Anita Bryant.

In fact, Dr. Kantor, who writes with a sort of uncontrollable reasonableness, and who prefers "it would seem" where anybody else you know would use "it is a definite, provable fact that," objected to the blurb. He was told that the book belonged to him, but the jacket was the business of John Wiley and his sons—and that, in any case, the statements made were perfectly justified by the book—might, in fact, even be understatements. Dr. Kantor is still uncomfortable with the blurb. His own preface describes *Information Mechanics* as providing "much of the conceptual basis and

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formal methods to date of what appears so far to be an interesting new path of inquiry." That, offhand, strikes me as a major contender for Understatement of the Century.

The trouble is, of course, that the great width both of theory and possible application makes *Information Mechanics* a little hard to describe. Maybe you ought to stop here, and go out and buy the thing. But you may not have the math, the background, or the $20 at hand at the moment; let me try to quarry out a few samples.

The central idea seems very simple. It is possible to express any transaction of any kind as an encoding and decoding of information. Billiard ball A is struck by a cue, or whatever's handy, and smacks into billiard ball B: the information (which B is equipped by its own physical properties to decode and act on) conveyed is: "Move in this plane, in this direction, at this speed, at this time—and so on."

All right so far, but an urgent footnote has to be shoved in here: you're as likely as I was to grab at an easy analogy, and think of frictional losses and so forth as taking the place of "noise" in information theory, but that isn't the world in which Dr. Kantor is operating. The information itself—the "code" which is, in fact, billiard ball A—is wholly conserved: there is no loss. All information is conserved—which is part of what Dr. Kantor treats as a three-part statement, but which can be put into a single postulate: "Information is conserved, communicable, and finitely accessible."

That is the only postulate involved. The theoretical basis for it is quite as good as the basis for various other conservation laws, and the practical, predictable results are a good deal more exact than people are used to. Dr. Kantor seems to have got a physical description of the world down to seven words and four numerical quantities—from which everything else is in principle derivable.

The quantities are fascinating, since all of them can be taken as 1, if that's handy, except the first. They are: I_U, the total amount of information in universe U, measured in bits, and (measured in any terms: Dr. Kantor isn't picky, since, as I say, these three can each be reduced to 1), R_U, the linear size of U, which is useful for calibrating length units; c, the linear coefficient of the "propagative local velocity" of light, useful for calibrating time units in terms of R_U,; and E_1, the energy per information-bit, useful in a world containing instruments calibrated in energy or mass units.

That "propagative *local* velocity" up there is just as startling as it looks. I asked Dr. Kantor whether he'd meant to imply that the velocity of light might not be *semper et ubique*, a constant, and his reply was as odd as the book: "Not quite: the question is whether this communication process is necessarily characterizable by 'velocity'."

All *right*. If you are beginning to feel that all of this is a giant put-on, a Velikovskian whirligig, or simply this writer's overreaction to a single book, try the following: Wiley attests to every fact in its blurb, and the book justifies it all quite perfectly:

All of the following are derived quantities, given those seven words and four numbers: the gravitational constant G, Planck's constant, Hubble's constant, weak interaction data,

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Maxwell's (source-free) equations—as stated for a vacuum: distortions due to other conditions are simple enough to work with—the "fine structure constant," and what Dr. Kantor calls "approximate" values for what appear to be, so far, the rest masses of the sixteen lightest "elementary particles." What appears to be strong interaction is also derivable (and is derived), and Dr. Kantor is now at work on some of the heavier "elementary particles."

Also simply derivable from his four quantities and seven words are special relativity and quantum mechanics—and a means of getting them to shake hands.

A great deal has changed, if *Information Mechanics* makes sense. (And it does seem to: see Table 3, with explanatory notes, on p. 268, which gives a large sample of Dr. Kantor's calculated results as compared with the previously reported results. You might note that what Dr. Kantor accepts as a discrepancy—what he will call "approximate"—is perhaps five parts per million; what most reports will accept is somewhere near ten parts per thousand. Explanations of column notation are provided with the table. Please note the odd typo: columns 7 and 8, in row 2-3, should carry the footnote (d). There don't seem to be many typos, all told, but a few will always creep in: note, for instance, that on page 260 r [in the main figure, not the exponent] seems to have crept into 9., and r^2 [main figure again] has horned into 10.: both should be tossed out.)

A great change: well, it's the difference between Ptolemaic and Copernican astronomy. It does take awhile to get used to this new Copernican system (Dr. Kantor has invented his own acronyms, here and there his own sort of—quite legitimate—math, and throughout his own English, which is a valiant attempt to write out in words a good many things for which the mathematics does not yet exist)—but once you get used to it, the ease and simplicity with which you can handle a variety of problems is startling.

It is perfectly possible to describe any astronomical event in Ptolemaic terms. It's also lots of fun, if you have a great deal of time on your hands and a fairly resourceful computer. But the stuff you come out with is so incredibly complex that it is almost impossible to think about any astronomical fact in relation to any other one.

The change to Copernican thinking made a lot more thinking possible. *Information Mechanics* does that: if change-of-position, change-of-temperature and change-of-intention (due to propaganda, learning, hypnotism or what-have-you) are all thought of as information transfers—usually only the last is—then all can be handled by the same set of tools. It becomes possible to handle physics with tools based on information concepts, and once you begin you seem to come up with a good many helpful notions. For instance:

What is "position"? Dr. Kantor asks that one at the end of his preface; he asks: "How high is up?" rather late in the book and of course answers it properly: R_U. Does change-of-position involve velocity? Does it involve passing through a number of intermediate "positions" on the way, and does change-of-position involve any time whatever? Don't answer in any great

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hurry: remember the tunnel diode, in which an electron appears here, and then over there, without having "crossed intervening space," if the phrase in quotes has any meaning.

What is "mass"? What is "gravity"? "Mass" seems to be a store of finitely many bits of information, related to other such stores; "gravity" looks like a description of what happens to two or more such stores as they exchange or otherwise transfer definable bits of information. An observer is on planet A. The closer planet A comes to, say, moon B, the less the store of possible position information moon B can have: out of all the places in the universe in which it might be, or among which parts of it might be scattered, it is only in a subset of such places—those inside a radius which shrinks as moon B approaches planet A and our observer. This loss of position-information—this increased specificity—appears to be what we mean both by "gravity" and by "curvature of space."

What is an "elementary particle"? Dr. Kantor's most elegant mathematics, in my view, is devoted to showing that *any* elementary particle can be reduced, for all practical and theoretical purposes, to photon(s): any additional qualities such as mass, charge, spin and so on are added information, coded in describable ways.

The bane of physics for over a century, "action at a distance," begins to dissolve: in Dr. Kantor's universe of information-bits, "distance" has no inherent meaning whatever (remember the tunnel diode), and "action" becomes the encoding and decoding of information, a process more primitive than time or space—from which the concepts of time and space, in fact, seem to flow.

I have two pieces of advice for the curious. First, buy the book: nothing you have experienced will do quite so much to order your mind regarding the physical universe.

Second: use this article as an introduction to Dr. Kantor's new and startling world. By all means begin with his preface—but skip all of his Section 1 and go straight to Section 2. Section 1 is meant as an overview of material to be gone through, more and more rigorously, later on, but it is simple hell to hack through without the background of the rest of the book, and this piece may serve as an amateur overview for awhile. If you need Section 1 later on, it'll be there; but start with Section 2.

I promise you, without reservation, that Dr. Kantor can give you a totally new view of physics and our universe, and that he can back that view with the most careful mathematics I have seen in some while, and with predictions that are accurate enough to raise the hair, if there is any, on the head of your average wandering muon.

And that promise is why I've taken Analog's space, and your time, to talk about *Information Mechanics*. There are quibbles I have with the book (a very late section on free will, of all things, seems to me to miss the point so grandly as to be available for a point-missing award; I doubt his flat statement that "black holes" are not possible in our universe, though I can't argue with the math), but the quibbles are awfully small. And the book, by comparison with anything you've looked into lately, is awfully god damned large. ■

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BRASS TACKS

Dear Mr. Schmidt,

Now that you are the new editor of *Analog,* and are free to change policy to some extent, do you think you could see fit to revive the feature, *The Analytical Laboratory,* dropped two years ago?

Ask the readers if they would like it back. It doesn't have to be accompanied by increased payments to authors. It wasn't originally, when John W. Campbell started it, way back in 1938. Authors would still like to know if their stories are going over with the readers. They can make allowances for the weighting of long stories over short, known authors over unknown, popular viewpoints over unpopular.

I think readership feedback is always a good thing, especially since *Brass Tacks* is usually limited to ideas rather than ratings.

DONALD FRANSON

I'd love to see the An Lab revived—if it could be meaningful. The problem which led to its being dropped was that not enough readers were rating the stories. With only a handful of votes, the results don't really indicate what the readers, as a whole, like and dislike. With a large sample, the results could mean a great deal.

I am considering trying to revive it, at least on a trial basis, but I'd like some idea first of how worthwhile the effort is. Do you *want the An Lab revived? Will* you *vote, regularly?* SS

Dear Mr. Bova,

The recent appearance of *Lucifer's Hammer* on national best-seller lists has brought me great pleasure. Almost a year ago, I interviewed Mr. Niven for a local newspaper, the *Austin Sun.* I had claimed to the newspaper that *Hammer* had more potential than any science fiction novel since *Andromeda Strain* of reaching the mass market beyond the genre. The final achievement of that potential makes possible some great benefits. Not only will a large number of readers be exposed to some very well written science fiction, but we may get one hell of a movie out of the deal!

I do not know the current status of negotiations (or perhaps even production) on a movie of *Hammer,* but certainly large sales will increase the probability of enough money being invested to do the film correctly. If *Star Wars* and company have set the stage for the movie industry to do some real science fiction cinema with a proper budget, then I for one am willing to forgive them almost anything (I enjoyed it anyway, as space opera). *Hammer* seems to have the best position of recent novels to take advantage of this situation, and I think readers of *Analog* should do anything in their power to encourage the film industry to proceed. Niven and Pournelle's novel may not be as close to the center of the genre as *2001,* but end-of-the-world yarns are an old and distinguished part of the field, and none has ever been done with the technical and scientific precision brought to bear on every page of *Lucifer's Hammer.*

JOHN K. GIBBONS

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Dear Ben:

The planetarium is an audio-visual theatre, which surrounds the viewer with an almost three-dimensional illusion of space. It excells at simulating star fields in space, panorama of landscapes and planet scapes and effects produced by animated (i.e. slewing, turning, zooming, dissolving etc.) effects. It does very poorly at showing locomotion or any other movement by living things.

However, due to the environmental qualities of the theatre, visitors are generally overwhelmed by the illusion of realism. Therefore the planetarium is an excellent medium for theatrical productions providing its difficulties are taken into account.

The Centennial planetarium invites writers and readers to submit scripts and story outlines for possible use in this rather difficult, but rewarding medium.

SIG WIESER

Centennial Planetarium
P.O. Box 2100,
Calgary, Alberta

Several science fiction stories have been done very well in the planetarium "medium": most notably, Isaac Asimov's "The East Question."

Dear Ben:

Just finished "I Put My Blue Genes On" by Orson Scott Card. Good story. But it reminded me that all your stories have one major fault. They are racist by implication and by supposition. They ignore the possibility that Japanese, Chinese, Indians, Arabs, Ethiopians etc. might found civilizations in the stars. Card at least mentioned the Chinese (only to explain briefly that they had all been wiped out) to concentrate on the real world beaters of 2810 A.D.—the Americans (granted they came from Hawaii), the Russians, and the Brazilians. Western civilization all. Most of your stories just ignore the existence of Earth's other races. Even a story about a planet peopled with the descendants of Japanese space explorers (Donald Kingsbury's excellent "Shipwright") feels it necessary to explain that this is an out-of-the-way, backward planet and that real interstellar civilization is white. Hope that in the future your writers will come to accept the fact that Nigerians as well as WASPs are star bound.

GORDON HESELTINE

Canandaigua, NY 14424

Why is there no science fiction written by Eastern authors? (Assuming Russia and Japan are Western nations.) Because Eastern cultures are a-scientific. They will get to the stars aboard Western ships—no matter who builds them.

Dear Ben:

As a graduate student in economics at the University of Wisconsin's Milwaukee campus and a long-time fan of science fiction, needless to say I was intrigued by your October editorial, "Hope and Fear." First of all, I would like to say that I have not read either the Rostow or the Brown book. Secondly, let me comment that your understanding of economics, whether obtained over a period of years or by reading those books, appears far sounder than of many people in authority. Too many times have I gnashed my teeth over the nonsense peddled by those who should know better, not to mention the letters to

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newspapers that go something like "Dear Editor, I'm no economist, but I have noticed that the economy started going bad around the time the postal rates went up. It seems that if we went back to the 3¢ stamp, all our economic problems would disappear . . ."

I fear the general public doesn't even have a good grasp of what a "soundly functioning economy" is. (I'm sure much of what I'm about to say appears in one form or another in Rostow's book, so please forgive my summary for the sake of my argument.) Given a fixed level of technology and a fixed quantity of labor and capital, there is a maximum level of output that can be generated. The question, then, is how to allocate this output in the most efficient manner. Economists are notoriously hesitant to offer value judgments, myself likewise, but the fact is that we generally wind up interpreting "most efficient" as "fairest." (We would hesitate to say that the entire wealth of the country should be owned by one, two, or even one million individuals, with the other two hundred million+ owning nothing. An extreme example, but it is a value judgment nonetheless. Still, I doubt that there would be any arguments.) This, then, is the general problem: Having let society determine the allocative principles it desires, how best to meet them? With notable exceptions, our economy uses the market system, a term that has suffered great misuse.

Nevertheless, no matter how it is allocated, the total potential output is fixed, given constant levels of technology and quantities of the factors of production (generally, land, labor and capital). That sentence holds all the key words. If certain factors of production are not being used (i.e., unemployed workers, factories operating below peak levels) we are obviously not producing up to our potential! This is the ultimate end of "pump priming," the notion of bringing idle resources back into the economy by "creating demand" for them. Also, note the two variables we are holding constant in our key sentence: factors of production, easy enough to picture as fixed in the short run; and technology, which simply does not remain fixed. As the level of technology rises, the total potential output of the system rises. This increased "potential" is of no avail if we have idle resources; however, in the long run technology has created far more jobs than it has eliminated. Improved technology also helps to lower the cost of individual units of that output, increasing economic well-being in still another way. This all serves to make Rostow's push for more research and development all very rational.

So what are we to make of Brown's contentions in light of all this? While I don't know Brown's specific arguments, it seems from your editorial that he has ignored one crucial possibility: the applications of technology are by no means confined to the production of "hardware." Scientific developments are every bit as capable of increasing the yield of the four biological systems as they are of increasing the output of screwdrivers. (And that means the lifetime yield, not just speeding up the "death" of the system.) Besides the potential discoveries undreamed of for our own planet, the long range contribution of space exploration will certainly bear

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some fruits. In addition, there can be "crossover" benefits from the hard sciences, as a dam built for hydroelectric power can help provide irrigation for croplands, etc. We cannot state flatly that a strong push for research and development will allow the yield from these biological systems to keep pace with our harvesting of them, but neither can we state that it won't. The only way to find out is to make our push for R&D as strong in the agricultural and biological sciences as Rostow would have it in the areas of energy, pollution, and transportation. (Indeed, Rostow hints at having foreseen a shade of Brown's predictions, for his fourth area is water-soil erosion.)

In answer to your editorial question, "Could we have both?" the answer is "Yes!" But we certainly don't have to. It all depends on how successful technology is in increasing the lifetime yields of Brown's four biological systems. And that depends, at least in part, on our willingness to invest in research and development right now.

MICHAEL KALLENBERGER
8102 W. Oklahoma Ave.
West Allis,
Wis. 53219

P. S. I can understand your enthusiasm in saying that Rostow's message sounds like that of the typical science fiction enthusiast, but you have it backwards. I have been a science fiction fan since I was approximately 12 years old and have studied economics only since age 19, and my first love will always be the former. Nevertheless, economists have included technology as a variable in their equations virtually since the discipline was founded, so I'd have to say that a science fiction enthusiast calling for heavy investment in R&D sounds like a typical economist. A matter of semantics, perhaps, but now that I've cleared it up I can sleep tonight.

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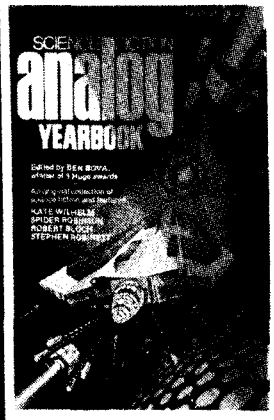

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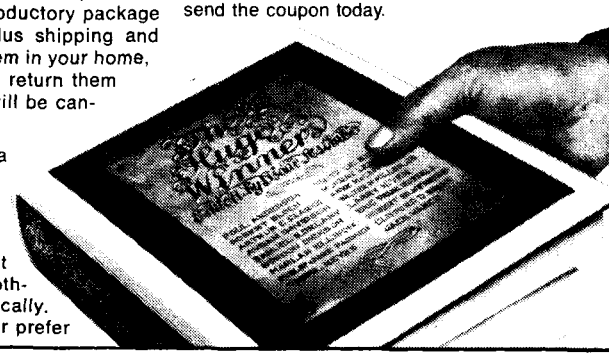

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